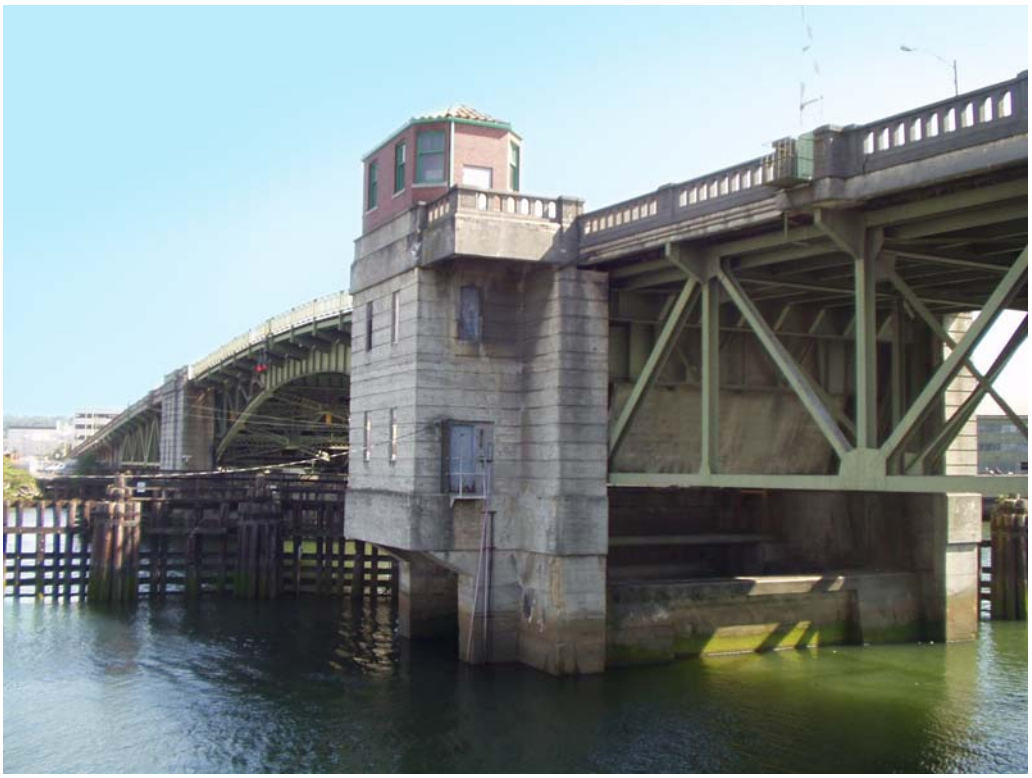
SOUTH PARK BRIDGE PROJECT

Draft Environmental Impact Statement and Section 4(f) Evaluation

Appendix Volume I

September 2005



U.S. Department of Transportation
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South Park Bridge Project

Summary Technical Report: Alternatives Development and Screening

Prepared for the
King County
Department of Transportation
201 South Jackson Street
Seattle, Washington 98104

Prepared by
Parsons Brinckerhoff, Inc.
999 Third Avenue, Suite 2200
Seattle, Washington 98104

September 6, 2002

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South Park Bridge Project

Summary Technical Report: Alternatives Development and Screening

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EXECUTIVE SUMMARY

This Summary Technical Report describes the development and evaluation of alternatives for the proposed South Park Bridge Project Environmental Impact Statement (EIS). Parsons Brinckerhoff (PB) conducted this work during the winter of 2001 and spring of 2002 in conjunction with King County project staff. It is the first major deliverable submitted to King County Department of Transportation as part of a scope of work that encompasses conceptual and preliminary engineering, environmental review, and public involvement for the potential replacement or rehabilitation of the South Park Bridge. The primary purpose of this work was to identify preliminary project alternatives that would receive detailed analysis in the EIS.

The initial element of this work was the development of a Purpose and Need Statement for the project. PB developed an initial draft statement, which was reviewed and revised based on comments received from various bodies including King County staff, the Project Advisory Committee (PAC), the Community Advisory Group (CAG), and the Federal Highway Administration (FHWA). The project objective is to find the most feasible long-term solution to address the deteriorated condition, substandard design deficiencies, and increasing seismic vulnerability of the South Park Bridge, while maintaining a vital transportation linkage for cars, trucks, buses, bicyclists and pedestrians across the Duwamish River. Key issues related to the eventual selection of a preferred alternative include: potential impacts to the community, impacts to the transportation system, the need to protect aquatic habitat, and the need to maintain Duwamish River navigation. The FHWA approved the final text of the Purpose and Need Statement in early April 2002.

Another element of the work involved the development of a number of potential project alternatives based on the project's Purpose and Need Statement and input from the EIS scoping process. Initially, the Project Team, members of King County staff, and the PB consultants identified a total of nine alternatives. These alternatives were based on earlier engineering and environmental studies as well as current thinking regarding the potential feasibility of prospective alternatives. Each of these alternatives was consistent with the Purpose and Need Statement and included both new construction alternatives, rehabilitation of the existing bridge, and closure of the existing bridge (the no-build alternative). The new construction alternatives included the following: a movable bascule bridge, a movable vertical lift bridge, a movable swing bridge, a fixed high-level bridge, a fixed mid-level bridge, a fixed low-level bridge, and a tunnel option.

In the next phase of the project work, PB conducted a number of initial baseline studies for use in comparing and contrasting the nine preliminary project alternatives. This work included a review of past engineering and environmental documentation related to the project. The engineering work included the development of conceptual engineering designs, analysis of traffic conditions and potential impacts, and a conceptual construction schedule. The consultant collected preliminary information on the existing conditions of the project area. This information included data on land use, traffic, cultural and historic resources, socioeconomic characteristics of the South Park neighborhood, recreational and commercial use of the Duwamish River, soil and water quality issues, plant and animal life, and background air and noise conditions. In addition, the PB environmental team scoped potential environmental review and permitting issues associated with the proposed project.

PB worked with King County staff to develop evaluation criteria to compare and contrast the nine preliminary project alternatives. These criteria addressed environmental impacts of the alternatives and the advantages and disadvantages of the alternative design options. In all, a total of seven criteria were adopted for use in the evaluation of the nine potential preliminary project alternatives. The resulting analysis of the alternatives allowed PB to screen out several of the potential preliminary project alternatives because they were either less feasible or would result in significantly greater environmental impacts.

This evaluation determined that a total of four of the nine potential preliminary project alternatives should be dropped from detailed analysis in the EIS. The Fixed Low-Level Bridge Alternative was primarily eliminated because its impacts to navigation on the Duwamish River would be too severe. The Movable Vertical-Lift Bridge Alternative was primarily eliminated because this option would result in significantly more visual and traffic impacts to the community than other feasible alternatives. The Movable Swing Bridge Alternative was primarily eliminated because it would result in significantly more right-of-way, visual impacts, and traffic impacts to the community in comparison to other alternatives. The Tunnel Alternative was primarily eliminated because it would result in significantly more environmental impacts to the fisheries habitat of the Duwamish River due to potential hazardous waste contamination in the river bottom sediments, traffic impacts on the neighborhood, and dislocation of several commercial property owners on 14th Avenue S.

Based on this evaluation, PB recommends King County staff consider a total of four alternatives for detailed analysis in the EIS. These alternatives include the following: the Fixed High-Level Bridge, the Fixed Mid-Level Bridge, the Movable Bascule Bridge, and the Retrofit Alternative. As required in a NEPA/SEPA EIS, the evaluation of the No-Action Alternative must also be considered. For this particular project, the No-Action Alternative assumes that the poor condition of the existing bridge will eventually lead to closure of the bridge, which would curtail all vehicular and pedestrian crossing the Duwamish River at the existing location. As such, the No-Action Alternative, though required in the environmental review analysis, does not meet the Purpose and Need Statement of the South Park Bridge Project. These alternatives will require a rigorous analysis of impacts and comparisons necessary for a defensible EIS.

1. INTRODUCTION

This Summary Technical Report describes the development, screening, and selection of alternatives for detailed evaluation in the EIS for the proposed South Park Bridge Project. The objective of this work was to identify a set of feasible alternatives for the project EIS in addition to the No-Action Alternative required by NEPA and SEPA regulations. More detailed analysis, design, and review will be performed for each of the selected alternatives during the preparation of the Draft EIS.

Alternatives Decision Context

The selection of alternatives is part of an EIS process that was formally initiated when the NEPA Notice of Intent (NOI) and SEPA Determination of Significance (DS) and Scoping Notice were issued on February 7 and February 14 of 2002, respectively. Other interrelated elements of the EIS process that influenced the selection of alternatives included scoping, advisory groups, and public involvement. An overview of these elements is provided below to clarify the overall context in which the alternatives selection process for the EIS occurred. Information from each of these sources was considered during each stage of the alternatives selection process.

Scoping

Scoping was initiated through the publication the NEPA NOI, and the publication and on site posting of the SEPA DS and Scoping Notice. Separate scoping meetings were conducted in the South Park community for relevant resource agencies and the public on February 28, 2002. As required under SEPA, notices were also mailed to property owners in the project area. Written and verbal comments received through the scoping process were reviewed by the EIS Project Team throughout the alternatives selection process.

Public Involvement

Public involvement efforts began prior to the formal scoping phase when a public workshop was held in the South Park community on January 17, 2002. A Public Involvement Plan (PIP) was developed during the initial stage of the scoping process with input from the PAC and the CAG. The goal of the PIP was to define a strategy for engaging the public and project stakeholders by providing opportunities for two-way communication with project staff throughout the EIS process. Additional public involvement measures have included a project web site, and distribution of informational material regarding the project and EIS process. The PIP also addresses the issue of environmental justice by providing additional measures to encourage the involvement of low-income and minority populations throughout the EIS process. In particular, Spanish translation of written information and verbal presentations at public meetings has been provided.

Community Advisory Group

Establishing a CAG was a significant component of the overall public involvement effort for the project EIS process. Fifteen individuals were chosen to participate as CAG members in order to provide broad representation of the stakeholder interests and public concerns associated with the South Park Bridge. The CAG meets periodically throughout the EIS process to help ensure that the full range of interests are informed and involved, and to provide effective feedback to the EIS Project Team. The meeting schedule for the CAG to date is listed below:

April 10, 2002	Initial review of draft Purpose and Need Statement and draft screening criteria.
May 21, 2002	Review of preliminary bridge alternatives and draft screening criteria.
June 4, 2002	Provided comment on screening criteria and alternatives recommended for further study in the EIS.
June 11, 2002	Final review of alternatives recommended for further study in the EIS.

Project Advisory Committee

As part of the EIS process, King County established a PAC. The PAC provided technical support and the perspective of relevant agencies for the alternatives selection process. It will continue to function as the Interdisciplinary Team (IDT) required under NEPA implementation guidelines throughout the EIS process. PAC meetings to date are listed below:

January 10, 2002	Introductory coordination meeting prior to formal scoping process.
February 20, 2002	Reviewed draft Purpose and Need Statement, draft screening criteria, and preliminary project alternatives.
May 9, 2002	Reviewed revised draft Purpose and Need Statement, draft screening criteria descriptions, and evaluation matrix (based on 2% engineering information).
May 23, 2002	Reviewed application of revised screening criteria to preliminary alternatives. Recommendations requested regarding alternatives for further analysis in the EIS.

Four build alternatives were ultimately recommended from the nine preliminary project alternatives that were identified based on both conceptual engineering and environmental baseline studies performed by PB. In addition, there was considerable coordination with agency representations and members of the South Park community, including the PAC and CAG as noted above. Draft summary information that was used to inform decisions earlier in the alternatives selection process is provided as an attachment to this report ("South Park Bridge Project: Supporting Documentation for 2% Alternatives Screening Analysis"). This document was prepared as an informational working paper that was used by the CAG and PAC, as well as the Project Team; however this working paper document was not finalized since it had essentially served its purpose. The attached draft version of the working paper provides a useful informational supplement for this report, although some of the information it presents has changed.

Organization of Report

This report is organized into five subsequent chapters. Chapter 2 describes how the project Purpose and Need Statement was developed. The final FHWA-approved text for the Purpose and Need Statement is included in this section. Chapter 3 describes the existing conditions of the bridge and summarizes earlier studies related to the proposed rehabilitation or construction of a new bridge/tunnel crossing of the Duwamish River in the South Park neighborhood. Chapter 4 reviews the engineering design criteria used to develop the potential alternatives. This text summarizes design decisions that have been made to date to minimize impacts. In addition, this chapter describes the nine alternatives proposed for evaluation. Chapter 5 describes the evaluation criteria, rating schemes, and screening results for the nine alternatives. The last chapter of the report presents the findings and conclusions of the report and recommends to King County which of the nine potential alternatives for the South Park Bridge Project should be evaluated in detail in the EIS.

2. PURPOSE AND NEED STATEMENT

This chapter describes the process of how the Purpose and Need Statement was developed iteratively by PB, King County staff, and the PAC. The second section of this chapter includes the current version of the South Park Bridge Project Purpose and Need Statement as approved by the FHWA.

Development Process

The development of the draft Purpose and Need Statement involved review and comment by a number of parties. PB developed the initial draft for review and comment by King County staff. In addition, the PAC reviewed the draft document. PB incorporated the comments from both King County staff and the PAC into the document to produce a final Purpose and Need Statement. The focus of this effort was to develop a Purpose and Need Statement that would be accepted by the NEPA federal lead agency, FHWA, and be a suitable foundation for Chapter 1 of the EIS.

The development of the Purpose and Need Statement followed the initiation of the EIS process in early February 2002. The principal issues to be addressed in the Purpose and Need Statement were originally drawn from the NEPA NOI and SEPA DS that were published on February 7 and 14 of 2002, respectively. This initial text was then modified based on agency input, public involvement, and additional analysis by the Project Team.

On February 19, 2002 PB submitted an initial draft Purpose and Need Statement to King County. The initial draft was subsequently revised several times with input from King County staff. PB prepared a revised draft, which King County forwarded to FHWA in April 2002 for review and approval. King County incorporated the non-substantive revisions provided by FHWA into a final draft version, which was presented at subsequent PAC and CAG meetings. The text of this approved final version of the Purpose and Need Statement (with a footnoted clarification) is contained in the following section.

Purpose and Need Statement

The following is a statement of the Purpose and Need for the South Park Bridge Environmental Impact Statement (EIS). A clear, well defined Purpose and Need is in many ways the most important part of an EIS. It justifies the wide range of environmental impacts by clearly demonstrating the need for the proposed action; it discusses in detail the problems the project is intended to correct; and it demonstrates the problems that will result if the project is not implemented. The draft Purpose and Need Statement will be refined numerous times by the Project Team as the EIS process continues. A number of key issues that will be taken into consideration during the EIS process are included at the end of this document.

Function and Role of the South Park Bridge

The King County Department of Transportation (KCDOT) is proposing the rehabilitation or replacement of the South Park Bridge located in King County, Washington. Since 1931 the movable span bridge has carried traffic along the 14th Avenue South and 16th Avenue South corridor across the Duwamish River. On a typical workday, a mix of approximately 20,000 cars, trucks and buses use the bridge to access employment centers in downtown Seattle and the Duwamish industrial area. Many of the vehicle trips originate in residential neighborhoods in the

communities of West Seattle, White Center and SeaTac. For residents of the community of South Park, the bridge is the only immediate means of access to and from the east. The movable structure spans the navigable waterway of the Duwamish River; opening to allow upstream access to both industrial and recreational vessels. The South Park Bridge is also a major route for heavy truck traffic traveling to and from large industrial manufacturers including the Boeing Company.

Purpose of the Proposed Action

The purpose of the proposed action is to find the most feasible long-term solution to address the deteriorated condition and increasing seismic vulnerability of the South Park Bridge, while maintaining a vital transportation linkage for cars, trucks, buses, bicyclists and pedestrians across the Duwamish River.

Need for the Proposed Action

In spite of substantial ongoing maintenance and repairs, the South Park Bridge has suffered significant deterioration over the past 70 years. Existing problems with the bridge worsened significantly following the Nisqually Earthquake in February 2001 and the bridge remains vulnerable to future seismic events. A recent bridge inspection conducted by King County resulted in an existing condition rating of 6.0 out of a possible score of 100 (based on Federal Highway Administration Criteria).[1] This is among the lowest ratings given any bridge structure in the State of Washington.

The bridge could be closed as a consequence of excessive structural deterioration or failure of the movable span operations (particularly in the event of another seismic event). Closure of the bridge would have a significant impact on the transportation system and traffic conditions throughout the lower Duwamish industrial area – including SR-99, SR-509, First Avenue South and East Marginal Way South. Improvements are required in the near future to protect public safety and to maintain a transportation corridor that is critical to the local and regional economy.

Seismic Vulnerability

The February 28, 2001 Nisqually Earthquake (magnitude 6.8, located 35 miles from Seattle and deep below the surface) caused significant damage to the South Park Bridge. The earthquake rendered the movable span inoperable, requiring the bridge to be closed for inspection and repairs intermittently for several days over a period of several months. The continuing periodic closure of the bridge for inspection and repairs has heightened the awareness of the need for rehabilitation or replacement of the existing bridge.

Roadway Design Deficiencies

The South Park Bridge does not meet current roadway design standards and has many design deficiencies. For example, the overall roadway width including lane widths, shoulders and sidewalks should be 64 feet according to current design standards. The existing roadway width is currently 46 feet.

[1] Source: King County. *Bridge Inspection Report*, August 1, 2002.
Note that previous version incorrectly stated rating was 8.0 for existing condition.

Transportation Issues
An average of 20,000 daily vehicle trips cross the Duwamish River on the South Park Bridge. It is a significant link between the east and west side of the Duwamish, both locally and regionally. The South Park Bridge is also a route for heavy and oversize truck traffic. According to previous studies, closure of the bridge would have a significant impact on the transportation system and traffic conditions throughout the lower Duwamish industrial area – including the Highway 99 and E. Marginal Way corridors.

Key Issues

Community Impacts
The existing South Park Bridge is a highly valued feature of the South Park community. There is widespread concern in the community that changes to the bridge could have a significant adverse impact on the community and the emerging economic vitality of the South Park business district centered along 14th Avenue South. The City of Seattle's South Park Neighborhood Plan identified as one of its primary objectives "finding a solution for the South Park Bridge that is sensitive to the needs of the community."

The South Park community is also ethnically diverse. Approximately 30 percent of the populations' primary language is not English. These factors require greater emphasis on the consideration of environmental justice in order to ensure that the potential adverse effects from the proposed project do not have a disproportionate impact on lower-income or minority populations.

Aquatic Habitat Protection
The Duwamish River is an important route for juvenile salmon migrating from the upper Green River toward Elliott Bay and the Pacific Ocean. However, much of the river in the vicinity of the South Park Bridge currently provides poor habitat for Chinook salmon (listed as threatened under the Endangered Species Act) and other marine organisms. The armored shoreline along the river in the project area provides minimal habitat for young Chinook salmon during their critical rearing period. Recovery plans now underway for threatened and endangered salmon will address potential means of enhancing habitat favorable to the survival and growth of young salmon from the Duwamish/Green River system. Restoration of the shoreline in the vicinity of the project would address immediate and long-term needs for habitat improvement along the Duwamish Waterway.

Duwamish Waterway Navigation
The Duwamish Waterway is used for industrial, commercial and recreational purposes. The South Park Bridge is near the upstream limit of heavy industrial uses along the waterway, but it is within the section of the waterway maintained by the U.S. Army Corps of Engineers as a navigation channel. A number of local businesses, as well as the U.S. Coast Guard, have emphasized to King County that any engineering solutions for the South Park Bridge must maintain navigational access upstream of the existing bridge.

3. EXISTING CONDITIONS AND PREVIOUS STUDIES

This chapter describes the current condition of the South Park Bridge. In addition, previous studies performed by King County or consultants are summarized. One report includes an engineering study of potential alternatives for rehabilitation or reconstruction of the bridge that was conducted by Sverdrup Civil, Inc. A second report prepared by Entranco, Inc. is an analysis and recommendation of potential future environmental review work that would likely be required for the proposed rehabilitation or reconstruction of the bridge. Other studies are also listed.

Existing Roadway/Bridge Conditions

Existing South Park Bridge

Since 1931, the movable span bridge has spanned the Duwamish waterway in the South Park neighborhood of the Seattle metropolitan area. See the vicinity and area maps (Figures 1 and 2).

The existing structure consists of a Scherzer rolling-lift double-leaf bascule movable span. Each side is flanked by two-deck truss and twelve concrete slab approach spans. The overall length of the bridge is 1,285 feet. The double-leaf bascule movable span has a center-to-center distance between the front bearings of 190 feet. The four-lane roadway width is 38 feet, with six-foot sidewalks on each side. See the existing bridge drawing (Figure 3).

The bascule spans are supported on reinforced concrete piers founded on timber piling. The two piers of the bascule bridge also support the counterweights, track supports, and racks for the rolling lift. In addition, these piers house the operating machinery, electrical equipment, and operator control room.

The South Park Bridge spans the navigable waterway of the Duwamish River. This river is used for industrial, commercial and recreational purposes. The South Park Bridge is near the upstream limit of heavy industrial uses along the waterway, but it is within the section of the waterway maintained by the U.S. Army Corps of Engineers as a navigation channel. The existing maximum vertical clearance of the bridge when closed is limited to 32 feet at Mean High High-Water (MHHW). The bridge opens three to five times per day on average to accommodate waterway traffic. The existing navigable horizontal clearance is approximately 125 feet at MHHW and narrows to approximately 92 feet between the two open bascule leaves, which is approximately 115 feet above the water level. The river channel (i.e., navigable waterway) beneath the South Park Bridge's movable span is approximately 15 feet deep.

Bridge Condition

In spite of substantial ongoing maintenance and repairs, the South Park Bridge has suffered significant deterioration over the past 70 years. Existing problems with the bridge worsened significantly following the Nisqually Earthquake in February 2001. Moreover, the bridge remains vulnerable to future seismic events. A 2002 bridge inspection conducted by King County resulted in a sufficiency rating of 6.0 out of a possible score of 100 (based on FHWA criteria).[2] This is among the lowest ratings given any bridge structure in the State of Washington this past year.

[2] King County, *Bridge Inspection Report*, August 1, 2002.

In the future, the bridge may require closure as a consequence of excessive structural deterioration or failure of the movable span operations, particularly in the event of another seismic event. Closure of the bridge would have a significant impact on the transportation system and traffic conditions throughout the lower Duwamish industrial area. Key arterials that would be affected include: SR-99, SR-509, First Avenue S. and East Marginal Way S. Improvements are required in the near future to protect public safety and to maintain a transportation corridor that is critical to both the local and regional economy.

Existing Roadway Network

The bridge presently accommodates an average daily traffic volume of 20,000 vehicles per day, based on 2001 City of Seattle traffic counts. Many of the vehicle trips originate in residential neighborhoods in the communities of West Seattle, White Center, and SeaTac. For residents of the community of South Park, the bridge is the only direct means of access to the east.

The existing roadway network surrounding the South Park Bridge consists of a variety of arterial types. Roadways range from local two-lane streets to major limited-access highway backbones. Regional traffic movement in the South Park area is concentrated to three north-south corridors including SR-99, SR-509, and East Marginal Way S. Local circulation is provided through a system of local and collector streets. Natural features such as the Duwamish waterway and large-scale land uses such as the Boeing Airfield create barriers within the network and limit opportunities for access to and from the major regional routes. The primary roadways surrounding the South Park Bridge include SR-99, SR-509, East Marginal Way S., 14th/16th Avenue S., the Boeing Access Road, and S. Cloverdale Street.

Existing Freight and Rail Movement

Freight movements in peripheral areas of the South Park community are noticeable due to the high concentration of industrial and manufacturing uses in the general area. Major heavy vehicle travel paths are primarily directed along East Marginal Way S. and SR-99 according to the City of Seattle Comprehensive Plan. S. Cloverdale Street is also used by trucks for access to SR-509 and SR-99 from 14th Avenue S. and is the preferred route through the community. With respect to rail movements, the only freight-related crossing applicable to this study exists near the intersection of East Marginal Way S. and 16th Avenue S. Field observations during peak commute traffic periods indicate no rail movements crossing the 16th Avenue S. approach. However, various off-peak site visits revealed some short-duration crossing activity. Trains generally consisted of only four to six cars.

Existing Pedestrian and Bicyclist Facilities

Based on the City of Seattle Bicycling Guide Map, 14th/16th Avenue S. is considered a "commonly-used" arterial by bicyclists though no designated bicycle lane is provided south of East Marginal Way S. The King County Bicycle Guidemap designates the bridge corridor as a "heavy traffic street without wide curb lane or shoulder." At this time, both pedestrians and bicyclists share the existing five-foot sidewalk on either side of the traffic lanes. This allows the bicyclists to avoid potentially hazardous on-pavement conditions created by the grated sections of the bridge deck; however, it does not meet current sidewalk standards for combined pedestrian and bicycle use.

Pedestrian and bicyclist volumes near the South Park community are generally low. Turning movement traffic counts for both the AM and PM peak periods revealed few non-motorist trips through the targeted intersections. Based on field notes, fewer than ten pedestrians and bicyclists were observed for each location during the two-hour peak period counts. Mid-day pedestrian volumes may be higher than the AM or PM peak periods due to lunch-related walking trips. This is especially applicable to areas within the South Park community.

Existing Transit Service

Transit routes serving the South Park community are primarily located along major north-south corridors such as East Marginal Way S. and 14th/16th Avenue S. Major King County Metro bus routes serving the area include: Route 60 (Capital Hill-White Center), Route 130 (Seattle-Des Moines); Route 132 (Seattle-Des Moines); Route 154 (Auburn-Boeing), Route 173 (Seattle-Federal Way), and Route 174 (Seattle/Sea-Tac/Federal Way). Routes 60 and 132 travel across the South Park Bridge and Route 130 travels along S. Cloverdale Street. Headways on these routes vary significantly depending on the time of day. During the morning and evening commuter periods, headways are between 10 and 30 minutes. Off-peak headways range from 20 to 60 minutes.

Summary of Previous Engineering Reports

Sverdrup Study

In November 1994, Sverdrup Civil, Inc. completed a report titled *14th/16th Avenue South Park Bridge Rehabilitation/Replacement – Design Report* for the King County Department of Public Works. The objective of that report was to evaluate alternative alignments and bridge types, impacts of the alternatives studied and to present to King County results, findings, conclusions, and recommendations of a preferred replacement bridge for the existing South Park Bridge.

The 1994 Design Report studied four alternatives: rehabilitation of the existing bridge; two fixed-span bridge replacements (a 100-foot vertical clearance bridge and a 60-foot vertical clearance bridge); a new movable bridge (double-leaf bascule bridge); and bridge closure (permanent closure and demolition of the existing bridge). Other alternatives that had been evaluated but were not carried forward in this report were: locating the replacement bridge immediately east (upstream) of the existing alignment (due to potential impacts to existing Boeing buildings); constructing a replacement bridge matching the existing alignment (due to traffic impacts during the two to three years of construction); and locating the northbound and southbound lanes on separate structures. These three alternatives were not considered feasible and thus were not studied further.

The 1994 Design Report recommended that the 60-foot vertical clearance fixed-span bridge design be used to replace the existing South Park Bridge.

Entranco Study

In July 1999, Entranco, Inc. completed an "Environmental Review Report" (June 23, 1999) for King County Department of Transportation on the proposed 16th Avenue S. Bridge Replacement Project. The objective of this report was to present to King County a summary of environmental review and permitting activities that would likely be required for the project.

The report identified the proposed project as replacement of the existing bridge, including improvements to the approach road – 14th Avenue S. to the south and 16th Avenue S. to the north of the Duwamish River. The project limits were identified as East Marginal Way S. on the north and S. Cloverdale Street on the south. The report assumed that three build alternatives should be selected for evaluation in the EIS, and potentially including alternatives with differing alignments and bridge types. It was further noted that three alternatives would likely be the least number needed to provide a reasonable range of alternatives as required under NEPA and SEPA regulations.

Entranco outlined the various tasks that would be required under the WSDOT Environmental Procedures Manual and various FHWA guidelines. The report identified these tasks to include the following: the development of bridge alternatives, and screening and selection of alternatives for analysis in the EIS; preliminary engineering design, including an update to the1994 Rehabilitation/Replacement Design Report; survey and mapping work; hydraulic and geotechnical studies, and conceptual-level design documentation. The report concluded that the alternatives proposed to date (including rehabilitation of the existing bridge) were not designed in enough detail to make a decision regarding a preferred alternative. Regarding the environmental review process, the report recommended that the public involvement program include coordination with an Interdisciplinary Team (IDT) of agency representatives and a Citizen Advisory Committee (CAG). The report also listed 17 specific environmental discipline reports that would likely be required for preparation of the EIS.

The findings and recommendations presented in the Entranco report formed the basis from which King County staff developed PB's original contracted scope of work for the project. The scope included engineering, environmental, agency coordination, and public involvement tasks.

Other Reports

Other reports available and used by PB for the current South Park Bridge Project analysis and the development of the conceptual 2% design alternatives and screening included the following:

Boeing Company, *Duwamish Corridor Redevelopment, Proposal/Design Guidelines*, May 1992.

Boeing Company and the City of Tukwila, *Draft Environmental Impact Statement, Duwamish Corridor Redevelopment Proposal*, May 1992.

Boss & Mayes Testing Engineers, Inc., *16th Avenue South Bridge, Concrete Condition Survey, Seattle, WA, BMTE No. 20694*, November 11, 1994.

BST Associates, *14th/16th Avenue South Bridge Economic Impact Analysis*, prepared for King County Department of Public Works, March 1995.

Echelon Engineering, Inc., *Underwater Inspection Report for the 14th/16th Avenue South Bridge, Bridge No. 8433700*, n.d.

Echelon Engineering, *Substructure Investigation, Testing and Assessment of Bascule Piers, 16th Avenue South Bridge*, September 1994.

EQE International, *Seismic Vulnerability Assessment of 14th/16th Avenue South Bridge, Seattle, WA*, prepared for King County Department of Transportation, February 1998.

Fernandes Associates, *16th Avenue South Bridge Alternatives Community Issues*, July 11, 1994.

Imbsen & Associates, Inc., *Final Report Seismic Study of 14th Avenue South Bridge*, prepared for King County DOT, August 23, 2001.

King County, *14th/16th Avenue South Bridge, Motor Room Rehabilitation*, Small Works Contract No. C85007C, n.d.

King County, *Liquefaction Evaluation, 16th Avenue South Bridge Approaches, Seattle, Washington*, August 1994.

King County, *14th/16th Avenue South Park Bridge Rehabilitation/Replacement Design Report*, November 1994.

King County, *14th/16th Avenue South Bridge – Rack and Pinion Gear Covers, Volume 1 of 1, Small Works Roster Contract C75243C*, November 1997.

King County, *14th/16th Avenue South Bridge – Epoxy Crack Injection, Contract C95074C, Technical Specification*, March 1999.

King County, *14th Avenue South Bridge As-Built Plans*, October 2001.

King County DOT/City of Seattle Transportation/Tukwila Public Works, *Inter-Local Agreement, CIP No. 300197 - 14th/16th Avenue South Bridge, South Park Bridge (Draft)*, n. d.

Shannon & Wilson, Inc., *Geotechnical Report, 16th Avenue South Bridge, Seattle, Washington*, September 1991.

Shannon & Wilson, Inc., *Liquifaction Evaluation: 16th Avenue South Bridge Approaches, Seattle, Washington*, August 1994.

Sverdrup Civil, *14th/16th Avenue South Bridge, Approach Spans Expansion Joint Repair Summary Report*, prepared for King County, September 1994.

Sverdrup Corporation, *16th Avenue South Bridge, Investigation Engineering Report*, July 1987.

Sverdrup Corporation, *14th/16th Avenue South Park Bridge, Foundation Design Report North Pier, Structural Calculations*, October 1991.

Sverdrup Corporation, *14th/16th Avenue South Bridge, Operational Study and Life Cycle Cost Analysis, Comparing Bridge Replacement Versus Rehabilitation*, April 1993.

Sverdrup Corporation, *14th/16th Avenue South Bridge, Concrete Approach Span, Load Rating Analysis*, December 1994.

Sverdrup Corporation, *Bridge Load Rating & Inspection Memorandum, 14th/16th Avenue South Bridge-Steel Approach Trusses and Bascule Span*, January 1996.

4. DESIGN CRITERIA AND PROJECT ALTERNATIVES

This chapter describes the engineering design criteria used to develop the potential alternatives for the rehabilitation or replacement of the South Park Bridge. In addition, this chapter describes in detail each of the nine potential alternatives that were screened. These alternatives include the following: the No Action Alternative, the Fixed High-Level Bridge Alternative, the Fixed Mid-Level Bridge Alternative, the Fixed Low-Level Bridge Alternative, the Movable Span Bascule Bridge Alternative, the Movable Vertical Lift Bridge Alternative, the Movable Swing Bridge Alternative, the Tunnel Alternative, and the Retrofit Alternative.

Design Criteria

Roadway Design Criteria

In the development of the roadway design criteria to be applied to each of the alternatives, it was necessary to consider the roadway design standards of the three local government jurisdictions on which this project encroaches. The Project Team developed a matrix that compared the various roadway design standards for King County, the City of Seattle, and the City of Tukwila. The matrix also compared the design standards that were proposed by the 1994 Design Report and the roadway design standards of the existing bridge. See the attached Roadway Design Standards Matrix (Figure 4). Based on the matrix, King County determined that the King County Roadway Design Standards would be the primary set of standards used for the development of the conceptual 2% design alternatives

During the development of the alternatives and preliminary evaluation of the alternatives, it became evident that less severe impacts would occur if design variations to the King County Standards were adopted. The Project Team concurred and concluded that variations to the design speed and maximum vertical grade would be acceptable. The design speed to be applied to all the alternatives was 35 mph versus the King County standard of 45 mph. The maximum grade was set at 8 percent versus the King County standard 9 percent maximum grade. After the selection of the five alternatives to be evaluated as part of the EIS, more design deviations may be considered to further reduce the project impacts.

In summary, the new roadway cross-section to be used for the three replacement alternatives would be: four 11-foot travel lanes; two 5-foot bike lanes; two 5-foot sidewalks, a design speed of 35 mph, and a maximum vertical grade of 8 percent. The Retrofit Alternative would consist of reconfiguring the existing four substandard lanes to two 17-foot southbound lanes and one 14-foot northbound lane to accommodate existing and future traffic volumes.

A more detailed design criteria report will be prepared to support the evaluation of the five alternatives in the EIS.

At this time and for the purpose of evaluating and screening the six new bridge alternatives, conceptual 2% design structural layouts were prepared for the Fixed High-Level Bridge, Fixed Mid-Level Bridge, Fixed Low-Level Bridge, Vertical Lift Bridge, Swing Bridge, and Bascule Bridge (see Figures 5–12). A more detailed Structural Design Criteria Report with a Type, Size and Location Report will be provided to support the evaluation of the five alternatives in the EIS.

Development of the Conceptual Alternatives

In defining the range of alternatives to be evaluated during this phase of the project, the Project Team developed specific guidelines for selecting alternatives for the evaluation of the conceptual 2% design alternatives. These guidelines were as follows:

- Ensure adherence to the Purpose and Need Statement required by the NEPA/SEPA process. See Chapter 2 (Purpose and Need Statement).
- Focus efforts on replacing or rehabilitating the existing structure within the existing South Park Bridge corridor, as much as possible, to minimize regional and local impacts.
- Use as much existing technical information as possible to minimize duplication of previous design efforts. See Chapter 3 (Existing Conditions and Previous Studies).
- Use input from the PAC, the CAG, the community, and include input received through the EIS scoping process. King County began this process by organizing several community workshops to obtain feedback from the local and regional users of the South Park Bridge. King County also organized several meetings to collect input from the PAC and the CAG.
- Address FHWA requirements that federally funded movable bridge replacement projects should consider a fixed-span bridge design in the alternatives evaluation.

Based on the above guidelines and information, a total of nine alternatives were selected for study as part of the evaluation of the conceptual 2% design alternatives. The reasons for selecting each of these alternatives are summarized in the following sections.

No Action Alternative

The No Action Alternative was selected for the alternatives evaluation based on NEPA/SEPA requirements. For all environmental evaluations, the "No Action" must be evaluated. For this project, the No Action Alternative assumes that the existing bridge structure would not be replaced or rehabilitated and would need to be closed in future years when it becomes inoperable. Based on input from the U.S. Coast Guard, it is assumed that the existing structure would need to be removed entirely, including all existing structural elements (e.g., movable spans, abutments, piers, mechanical elements). It would be possible to leave the approaches, abutments and piers, but this would require approval by the Corps of Engineers.

Fixed High-Level Bridge Alternative

A Fixed High-Level Bridge Alternative was selected as a preliminary project alternative based on the need to consider a fixed-span alternative that would not interfere with current navigation use of the Duwamish River. Based on previous documentation and input from the U.S. Coast Guard, a minimum 100-foot vertical clearance from MMHW would be needed to satisfy navigation clearance requirements. Alternatives evaluation was based on input from two public workshops, the PAC, and the CAG. To avoid possible impacts to businesses upstream on the Duwamish River, the Project Team decided the alternative should accommodates all existing river traffic, which would require the bridge design to have a minimum vertical clearances near 100 feet.

Fixed Mid-Level Bridge Alternative

A Fixed Mid-Level Bridge Alternative was selected for the alternatives evaluation based on input from two public workshops, the PAC, and the CAG. It was the preferred alterative based on the previous 1994 Design Report. In addition, the King County Executive and mayors of Seattle and Tukwila identified this option in the Letter of Intent in 1999. The alternative allows for a vertical clearance of approximately 60 feet for river traffic and has fewer impacts to the South Park neighborhood compared to the Fixed High-Level Bridge Alternative. However, this alternative would result in greater impacts to businesses upstream on the Duwamish River due to the height limitations.

Fixed Low-Level Bridge Alternative

A Fixed Low-Level Bridge Alternative was selected for the alternatives evaluation based on input from two public workshops, the PAC, and the CAG. This alignment has fewer impacts to the South Park neighborhood than the Fixed High-Level and Fixed Mid-Level bridge alternatives. However, this alternative would have potentially significant impacts to businesses upstream on the Duwamish River, because it limits vertical clearance to approximately 35 feet for river traffic.

Movable Span Bascule Bridge Alternative

A Movable Span Bascule Bridge Alternative was selected for the alternatives evaluation based on input from the PAC and the CAG, and based on previous work. This alternative most closely replicates the exiting bascule bridge structure type. Two movable spans of the bridge deck are cantilevered open to allow marine traffic to pass under the bridge. It would allow unlimited vertical clearance for river traffic on the Duwamish River.

Movable Vertical Lift Bridge Alternative

A Movable Vertical Lift Bridge Alternative was selected for the alternatives evaluation based on input from the Project Team and considering input from the PAC and the CAG. This alternative vertically raises a mid-section of the bridge deck to allow for passage of tall marine traffic. This alternative was not studied previously. The alternative was chosen because it uses a different mechanism to allow passage of river traffic than the existing bascule design. This movable design, however, would still limit vertical clearance for river traffic.

Movable Swing Bridge Alternative

A Movable Swing Bridge Alternative was selected for the alternatives evaluation based on input from the Project Team and input from the PAC and the CAG. The “swing” portion of this alternative allows two mid-sections of the bridge deck to rotate horizontally 90 degrees to create an opening for river traffic. This alternative was not studied previously. This alternative was chosen because it uses a different mechanism to allow passage of river traffic than the existing bascule design.

Tunnel Alternative

A Tunnel Alternative was selected for the alternatives evaluation based on input from two public workshops, the Project Team, the PAC, and the CAG. This was not a previously studied alternative. A member of the CAG specifically requested this alternative at a community workshop. The Project Team and PAC concurred that the alternative should be evaluated as part of the evaluation of the conceptual 2% design alternative.

Retrofit Alternative

A Retrofit Alternative was selected for the alternatives evaluation based on input from two public workshops, the PAC, the CAG, and the Project Team. This alternative was also previously studied. This alternative would provide the best basis for preserving the historic character of the existing bridge.

In sum, the nine preliminary alternatives were selected based on the issues and procedures described above, including input from the Project Team, the PAC, the CAG, and members of the community. Exclusive of the No Action Alternative, five of the selected alternatives had been previously studied. These alternatives included the three vertical profiles for a fixed-span bridge, a bascule bridge, and rehabilitation of the existing bridge. However, the selection of preliminary alternatives was not limited by the consideration of previous studies. Two new movable span bridge alternatives (the vertical lift and swing bridge designs) and a tunnel alternative were selected for consideration.

Description of Alternatives

This section describes in detail each of the nine potential alternatives for the rehabilitation or replacement of the existing South Park Bridge that were selected for evaluation. Key aspects of each of these alternatives described below include the project alignment, area of impact, vertical clearance for river traffic, bridge design, and traffic operations. Plan and profile drawings of each of these alternatives are included in the Figures Section at the end of this report (see Figures 5–12).

No Action Alternative

For the No Action Alternative, it is assumed that the existing bridge structure would be closed in future years due to eventual deterioration beyond the point where bridge operation and safety could be reasonably maintained. At that point, no vehicular, bicycle, or pedestrian traffic would be allowed to use the bridge. In order to address river navigation concerns, the existing structural elements (e.g. movable spans, abutments, piers, mechanical elements) would be removed.

Fixed High-Level Bridge Alternative

For the Fixed High-Level Bridge Alternative, a new bridge structure would be constructed downstream approximately 80 feet (centerline to centerline) west of the existing bridge (see Figures 5 and 5a). The existing bridge structure would be removed after construction is complete. To minimize impacts on the community, the high profile of the bridge would require 8-9 percent grades, which is a minor deviation to the design criteria established in Chapter 4. The bridge length would be approximately 2,720 feet, not including roadway approaches. Road improvements would extend north from S. Concord Street along the existing right-of-way of 14th Avenue S., cross the river, and continue north to and include East Marginal Way S. S. Cloverdale Street would no longer have direct access to 14th Avenue S. and S. Donovan Street would be closed. It would require modification of the intersection of 16th Avenue S. and East Marginal Way S. as well as the existing railroad tracks immediately south of this intersection. The bridge design would allow for a 100-foot minimum vertical clearance and an approximate 125-foot minimum horizontal clearance for river traffic.

Fixed Mid-Level Bridge Alternative

The Fixed Mid-Level Bridge Alternative would follow the same horizontal alignment as the Fixed High-Level Bridge Alternative (see Figures 6 and 6a). The bridge length would be approximately 1,985 feet from the abutment faces, not including roadway approaches. South-end road improvements would extend south to S. Donovan Street. S. Cloverdale Street would require modification to continue to have access to 14th Avenue S. The road project would extend north to a point approximately 400 feet south of East Marginal Way S. Roadway improvements would not be required at the intersection of 16th Avenue S. and East Marginal Way S. or the existing railroad tracks south of this intersection. The bridge design would allow for approximately a 125-foot minimum horizontal clearance for river traffic, but would limit vertical clearance of approximately 60 feet.

Fixed Low-Level Bridge Alternative

The Fixed Low-Level Bridge Alternative would follow the same horizontal alignment as the Fixed High-Level and Fixed Mid-Level Bridge Alternatives (see Figures 7 and 7a). The bridge length would be approximately 1,110 feet from the abutment faces, not including roadway approaches. The approach grades would be approximately 6 percent. The south roadway improvements would extend north of a point mid-block between S. Cloverdale and S. Donovan streets. The north end project terminus would extend north to a point approximately 500 feet south of the intersection of 16th Avenue S. and East Marginal Way S. Similar to the Fixed Mid-Level Bridge Alternative, this bridge design would allow for an approximately 125-foot maximum horizontal clearance for river traffic, but would limit vertical clearance to a maximum of 35 feet (same as the existing bridge when closed).

Movable Span Bascule Bridge Alternative

The Movable Span Bascule Bridge Alternative would follow the same horizontal and vertical alignment as the Fixed Low-Level Bridge Alternative (see Figures 7a and 8). The bridge length would be approximately 1,125 feet from the abutment faces, not including roadway approaches, and grades would be approximately 6 percent. The roadway approaches to the new structure would extend from a point just north of S. Cloverdale Street on the south side of the river north to a point about 500 feet south of East Marginal Way S. Like the existing bascule bridge, this bridge profile would be 35 feet clear of the river. The mid-section spans could cantilever open to allow unlimited river traffic to travel past the bridge.

Opening and closing the bridge would each take approximately 4-6 minutes, plus the time needed to let boats or barges pass through. The north and south new roadway terminus would be similar to the Low-Level Bridge Alternative. The navigable river channel dimensions would be similar to the existing waterway and would be approximately 125 feet wide, but would not impose limitations to the height of river traffic passing upstream.

Movable Vertical Lift Bridge Alternative

The Movable Vertical Lift Bridge Alternative would follow the same horizontal and vertical alignment as the Fixed Low-Level Bridge Alternative (see Figures 7a and 9). The bridge length would be approximately 1,194 feet (not including roadway approaches), and grades would be approximately 6 percent. The roadway approaches to this structure would extend from a point north of S. Cloverdale Street on the south side of the river to a point about 500 feet south of East Marginal Way S. The north and south new roadway termini would be similar to the Low-Level

Bridge Alternative. Like the existing bridge, the bridge profile would be approximately 35 feet clear of the river, but the middle span of the bridge would be movable to allow passage of boats and barges. The movable span of this bridge allows for a center section of the bridge to be raised approximately 100 feet in height above the MHHW. Opening and closing the bridge would each take approximately 10-15 minutes, plus the time required to let boats or barges pass through. Support structures to operate the bridge would extend approximately 150-200 feet above the river. Similar to the Fixed Mid-Level Bridge Alternative, the bridge design would allow for an approximately 125-foot horizontal clearance for river traffic.

Movable Swing Bridge Alternative

The Movable Swing Bridge Alternative would follow the same vertical alignment as the Fixed Low-Level Bridge Alternative, but the horizontal alignment is shifted approximately 150 feet downstream from the existing bridge centerline (see Figures 10 and 10a). This alignment change is required to accommodate construction of the movable portion of the bridge. The bridge length would be approximately 1,134.5 feet, not including roadway approaches, and grades would be 6 percent. The roadway approaches to the new structure would extend north of S. Cloverdale St. on the south side of the river and to a point about 500 feet south of East Marginal Way S. The south and north termini of the roadway project would be similar to the Fixed Low-Level Bridge Alternative. For this design, two mid-sections of the bridge deck rotate 90 degrees to create an opening for marine vessels. Opening and closing the bridge would take approximately 10-15 minutes each, plus the time required to let boats or barges pass through. This bridge design would allow unlimited boat heights to travel past the bridge and would allow for an approximately 125-foot horizontal clearance. Like the existing bridge, the profile of this alternative would be approximately 35 feet above the river.

Tunnel Alternative

A Tunnel Alternative was selected for the alternatives evaluation based on input from the Design Team, the PAC and the CAG. It was not a previously studied alternative. A member of the CAG specifically requested consideration of a tunnel alternative at a community workshop. The Project Team and PAC concurred that this should be an alternative considered as part of the conceptual 2% design alternative evaluation process.

The Tunnel Alternative would differ entirely from any of the other build alternatives, as a new bridge would not be constructed to replace the existing bridge (See Figure 11). Rather, a tunnel would be constructed under the river. The construction of the Tunnel Alternative could be accomplished using a tunnel-boring machine or cut-and-cover construction methods.

For a bored tunnel alternative, the top of the tunnel would need to be more than 80 feet below the existing river bottom based on known soils and geotechnical information. The tunnel length would be approximately 3000 feet, portal to portal. Tunnel grades would be 8-9 percent. The roadway approaches to the portal of the tunnel would extend south to S. Henderson Street on the south side of the river and would extend into Boeing Field property north of East Marginal Way S. Cross-streets including S. Concord Street, S. Trenton Street, and S. Donovan Street would lose direct access to 14th Avenue S. Due to the length of the tunnel, special ventilation equipment would be required (based on a conceptual ventilation review). Vent shafts would be constructed on each side of the river and would extend approximately 50 feet above ground level. Fire, life and safety requirements would also need to be incorporated into the design of this alternative.

The design of the tunnel using the cut-and-cover construction method would bury the top of the tunnel approximately 7-10 feet below the existing river bottom. The tunnel length would be approximately 1500 feet, portal to portal. Tunnel grades would be 8-9 percent. The roadway approaches to the tunnel would extend south to S. Trenton Street on the south side of the river and would extend north to East Marginal Way S. on the north side of the river. These necessary roadway improvements would require reconstruction of the intersection of 16th Avenue S. and East Marginal Way S. and would impact the existing railroad tracks immediately south of East Marginal Way S. Also, S. Cloverdale Street, S. Sullivan Street, Dallas Avenue S., and S. Orr Street would lose direct access to 14th Avenue S. Due to the length of the tunnel, special ventilation equipment would be required. A total of eight jet fans would need to be installed. Fire, life and safety requirements would also need to be incorporated into the design of this alternative.

To avoid impacts to the Boeing Field and keep the tunnel length within the project area, the environmental impacts of this alternative assume that the cut-and-cover construction methodology would be used. The necessary roadway improvements would be similar in extent to the Fixed High-Level Bridge Alternative.

Retrofit Alternative

For the Retrofit Alternative, the existing bridge would remain in place and the structure would be reinforced. Because studies have confirmed the existing bridge support piers are shifting in the river bottom, the rehabilitation work would need to stabilize the piers. Based on previous studies, the existing bascule piers would be stabilized by constructing a concrete casing around the outside of the existing pier structures that extends into the riverbed to a depth exceeding the depth of the current pier structures. This casing could narrow the existing approximately 125-foot lower width horizontal clearance of the navigable channel by approximately 20-30 feet. The mechanical and electrical systems used to operate the bridge would be refurbished and/or replaced (see Figure 12). Other components of the bridge may have to be replaced and the full scope of work has not yet been determined.

In general, this alternative would attempt to bring the bridge up to today's standards while preserving the historic character of the existing bridge. To meet current road design standards, the number of lanes on the roadway would be reduced from four substandard lanes to three standard lanes, two southbound lanes and one northbound lane. Bicycle and pedestrian traffic would continue to be able to use the bridge. Pedestrians and cyclists would continue to share the use of the existing 5-foot sidewalk due to potential safety hazards for cyclists riding across the grated sections of the bridge deck.

5. EVALUATION OF THE ALTERNATIVES

This chapter describes the evaluation and screening of the nine preliminary alternatives in order to select the alternatives to be analyzed in the EIS. An initial set of screening criteria was developed based on the general issues that had been identified at that point, including input from the PAC, the CAG, public and agency scoping responses. The initial screening criteria were revised several times in order to produce the 25 draft screening criteria. These draft screening criteria were reviewed by the CAG and PAC, and further revisions were made to consolidate the criteria into a more concise set. Ultimately, a set of seven criteria was established as the basis for evaluating the nine preliminary alternatives. These criteria included the following:

- regional mobility
- local access
- Duwamish River waterway navigation
- community impacts
- aquatic habitat protection
- construction impacts
- cost

A rating scheme was established for each criterion to provide a consistent basis for evaluating each alternative. This initial rating scheme was reviewed by the CAG and the PAC, and subsequently revised by King County and PB. The ratings represent a generalized, relative scale of impacts with values that vary among the seven different criteria. The ratings for each criterion are presented below, following an overview of the issues associated with that criterion. The rating of each alternative is then described. At the end of this chapter, there is a brief summary of the cumulative ratings for each of the preliminary alternatives.

Regional Mobility

Overview

The existing roadway network surrounding the South Park Bridge in the South Park neighborhood consists of a variety of arterial types. Roadways range from local two-lane streets to major limited-access highways. Regional traffic movement in the South Park neighborhood is concentrated on three north-south corridors including SR-99, SR-509, and East Marginal Way S. Natural features such as the Duwamish Waterway and large-scale land uses such as the Boeing Airfield create barriers within the network and limit opportunities for access to and from the major regional routes. Major heavy-vehicle travel routes are primarily directed along East Marginal Way S. and SR-99 according to the City of Seattle Comprehensive Plan. S. Cloverdale Street is a designated truck and transit route for access from 14th Avenue S. to SR-99. In addition, 16th Avenue S., the South Park Bridge, and 14th Avenue S. together provide direct access between East Marginal Way S. and SR-99. The 14th/16th Avenue S. corridor is also the main commercial street in the community and is the preferred route through the South Park neighborhood. King County, the City of Seattle, and the City of Tukwila feel it is vital that the linkage provided by the South Park Bridge continues to function in the regional roadway network and that regional arterials continue to operate at acceptable levels of service.

Rating Scheme

The following rating scheme was used to evaluate the preliminary alternatives:

No Impacts: The capacity of regional corridors is not affected. The alternative would maintain the same level of service for vehicular, freight, and transit operations as if the existing bridge remained in place. Access to regional arterials would not be affected.

Minimal Impacts: Regional corridors would operate within acceptable levels of capacity. The alternative would maintain a similar level of service for vehicular, freight, and transit operations as if the existing bridge remained in place. Access to regional arterials would not be affected.

Moderate Impacts: Regional corridors would operate within acceptable levels of capacity. The alternative would maintain a similar level of service for vehicular, freight, and transit operations as if the existing bridge remained in place. Access to regional arterials would be affected moderately.

Severe Impacts: Regional corridors would reach or exceed capacities. The alternative would reduce the level of service for vehicular, freight, and transit operations compared to conditions with the existing bridge in place. Access to regional arterials would be significantly affected.

Alternatives Analysis

No Action Alternative

The No Action Alternative should be rated as having *Severe Impacts*. This alternative would result in closure of the existing South Park Bridge, an important link in the existing roadway network. Traffic that would normally use the bridge would need to take other roadways. The re-routing of the significant volume of traffic that currently uses the bridge would reduce the level of service of nearby regional arterials. See the traffic analysis in the Attachment at the end of this report for detailed Level of Service (LOS) forecasts for major intersections in the project vicinity.

Fixed High-Level Bridge Alternative

The Fixed High-Level Bridge Alternative should be rated as having *Moderate Impacts*. This alternative would continue to allow traffic to travel south across the Duwamish River via a new South Park Bridge. The new bridge would be constructed to current road design standards, which would increase the capacity of 14th Avenue S. and 16th Avenue S. This increased capacity would potentially improve the level of service of these two roads and other arterials in the region. The extreme length of this roadway project, however, would result in closure of S. Cloverdale Street at 14th Avenue S. Truck and transit traffic currently using this designated truck and transit route street would need to be rerouted in the community.

Fixed Mid-Level Bridge Alternative

The Fixed Mid-Level Bridge Alternative should be rated as having *No Impacts*. This alternative would continue to allow traffic to travel south across the Duwamish River via a new South Park Bridge. The new bridge would be constructed to current road design standards, increasing the capacity of 14th Avenue S. and 16th Avenue S. This increased capacity would potentially improve the level of service of these two roads and other arterials in the region. Truck and transit traffic would continue to use S. Cloverdale Street, despite the moderate length of this roadway project.

Fixed Low-Level Bridge Alternative
The Fixed Low-Level Bridge Alternative should be rated as having *No Impacts*. Like the Fixed Mid-Level Bridge Alternative, this alternative would continue to allow traffic to travel south across the Duwamish River via a new South Park Bridge. The new bridge would be constructed to current road design standards, which would increase the capacity of 14th Avenue S. and 16th Avenue S. and potentially improve the level of service of area arterials. Traffic on 14th Avenue S. would continue to have access to S. Cloverdale Street.

Movable Span Bascule Bridge Alternative
The Movable Span Bascule Bridge Alternative should be rated as having *No Impacts*. The impacts of this alternative on regional mobility would be very similar to those described above for the Fixed Low-Level Bridge Alternative.

Movable Vertical Lift Bridge Alternative
The Movable Vertical Lift Bridge Alternative should be rated as having *No Impacts*. The impacts of this alternative on regional mobility would be very similar to those described above for the Fixed Low-Level Bridge Alternative.

Movable Swing Bridge Alternative
The Movable Swing Bridge Alternative should be rated as having *No Impacts*. The impacts of this alternative on regional mobility would be very similar to those described above for the Fixed Low-Level Bridget Alternative.

Tunnel Alternative
The Tunnel Alternative should be rated as having *Moderate Impacts*. This alternative would continue to allow traffic to travel south across the Duwamish River via the tunnel. The tunnel would be constructed to current road design standards, which would increase the capacity of 14th Avenue S. and 16th Avenue S. and potentially improve the level of service of area arterials. Traffic on 14th Avenue S., however, would not likely be able to continue to have access to S. Cloverdale Street due to the vertical alignment of the tunnel at this intersection.

Retrofit Alternative
The Retrofit Alternative should be rated *Minimal Impacts*. This alternative would continue to allow traffic to travel south across the Duwamish River at the existing bridge. To meet current road design standards, however, the current four substandard lanes would need to be reduced to three wider lanes. This reduction in roadway capacity could potentially result in slightly reduced level of service on area arterials. Truck and transit traffic on 14th Avenue S. would continue to have access to S. Cloverdale Street.

Local Access

Overview

PB evaluated potential long-term impacts to local access in the South Park neighborhood for each of the alternatives. This criterion evaluates the potential changes in pedestrian, bicycle, and vehicular access to neighborhood commercial services, public services, and recreation facilities. In addition, this criterion evaluates changes in access between neighborhoods and residential districts within the community. The key factor considered in making this evaluation examined changes in local street access to 14th Avenue S. and the South Park Bridge, including street closures, limited turning movements, traffic re-routes, and traffic diversions, and lack of direct access to the replacement bridge or tunnel. Street closures not only impact the vehicular traffic, but bicycle and pedestrian traffic is also potentially impacted. In addition, construction of an alternative could change the elevation of existing intersections on 14th Avenue S. Some cross streets would become overpasses, and some would become underpasses. In addition, the construction of the movable bridges would cause periodic increases in local traffic congestion when the movable spans open for marine vessels to pass. In addition, depending on the type of movable bridge design, these periods of congestion could be slightly longer than other designs, which could worsen local traffic congestion, especially during peak hours.

Rating Scheme

The following rating scheme was used to evaluate the preliminary alternatives:

No Changes: No street closures, traffic re-routes, or traffic diversions affecting access to 14th Avenue S. or the South Park Bridge.

Minimal Change: Small number of street closures, traffic re-routes and traffic diversions affecting access to 14th Avenue South or the South Park Bridge.

Moderate Changes: Numerous street closures, traffic re-routes and traffic diversions affecting access to 14th Avenue South or the South Park Bridge. A few existing road crossings would not have access to 14th Avenue S., some of which would change to an overpass or an underpass.

Significant Changes: Significant and/or a large number of street closures, traffic re-routes and traffic diversions affecting access to 14th Avenue South or the South Park Bridge. Several existing road crossings would not have direct access to 14th Avenue S., some of which would change to an overpass or an underpass.

Alternatives Analysis

No Action Alternative

The No Action Alternative should be rated *Significant Changes*. This alternative results in the closure of the South Park Bridge. Despite the fact that no other local roads would be closed or traffic re-routed, this change to the local road network would be very significant. All vehicular, bicycle, and pedestrian traffic would need to find alternative routes to cross the Duwamish River.

Fixed High-Level Bridge Alternative
The Fixed High-Level Bridge Alternative should be rated *Significant Changes*. For this alternative, a new bridge would be constructed. The extreme length of the project impact area, however, would affect the majority of the existing streets that cross 14th Avenue S. within the project area. Only two of the existing six cross streets in the project area south of the river would continue to have the same access to 14th Avenue S. and the bridge. One street, S. Cloverdale Street, would be closed. An additional three street intersections would be converted to underpasses due to the height of the bridge and distance before the grade of the bridge meets existing street grade. This alternative is a fixed-span bridge and would not be expected to periodically create local traffic congestion.

Fixed Mid-Level Bridge Alternative
The Fixed Mid-Level Bridge Alternative should be rated *Moderate Changes*. For this alternative, a new bridge would be constructed. The moderate length of the project impact area would affect many of the streets that currently cross 14th Avenue S. Three of the existing cross streets in the project area south of the river would continue to have the same access to 14th Avenue S. and the bridge. Two local streets would be closed and one street would be converted to an underpass. This alternative is a fixed-span bridge and would not be expected to periodically create local traffic congestion.

Fixed Low-Level Bridge Alternative
The Fixed Low-Level Bridge Alternative should be rated *Minimal Changes*. The construction of the replacement bridge would allow five of the existing cross streets in the project area south of the river would continue to have the same access to 14th Avenue S. and the bridge. Another street crossing would be modified to a new underpass built to current design standards. This alternative is a fixed-span bridge and would not be expected to periodically create local traffic congestion.

Movable Span Bascule Bridge Alternative
The Movable Span Bascule Bridge Alternative should be rated *Minimal Changes*. The construction of the replacement bridge would result in the same impacts to local streets as described above for the Fixed Low-Level Bridge Alternative. This alternative is a movable-span bridge and the time required to open and close the bascule bridge would be the less than the other two types of movable bridge designs considered.

Movable Vertical Lift Bridge Alternative
The Movable Vertical Lift Bridge Alternative should be rated *Minimal Changes*. The construction of the replacement bridge would result in the same impacts to local streets as described above for the Fixed Low-Level Bridge Alternative. This alternative is a movable-span bridge and the time required to open and close the bridge would be more than a bascule bridge.

Movable Swing Bridge Alternative
The Movable Swing Bridge Alternative should be rated *Minimal Changes*. The construction of this replacement bridge would result in very similar impacts to local streets as described above for the Fixed Low-level Bridge Alternative. Four of the existing cross streets would continue to have access to 14th Avenue S. and the bridge, but two streets that currently cross this main thoroughfare would be closed. This alternative is a movable-span bridge and the time required to open and close the bridge would be more than a bascule bridge.

Tunnel Alternative
The Tunnel Alternative should be rated *Significant Changes*. Construction of the tunnel would result in a number of impacts to local streets in the project area. A total of three of the existing streets that cross 14th Avenue S. south of the river would continue to have access to 14th Avenue S. and the tunnel. Three other cross streets in the project area would lose access to the tunnel crossing of the river and would be modified to be overpasses. As a tunnel crossing of the Duwamish River, this alternative would not be expected to periodically create local traffic congestion due to bridge openings.

Retrofit Alternative
The Retrofit Alternative should be rated *Minimal Changes*. For this alternative, the existing bridge would remain in place and the structure would be stabilized and rehabilitated. All existing vehicular, bicycle, and pedestrian traffic would be able to continue to cross the Duwamish River at the existing location of the South Park Bridge. The bridge would remain operable and all of the existing streets in the project area would continue to have the same access to 14th Avenue S. and the bridge. This alternative is a movable-span bridge and the time required to open and close a bascule bridge would be the less than the other two types of movable bridge designs considered. Over the long-term, however, the poor condition of the existing bridge would be expected to require major repair and maintenance work. To conduct this work, the bridge would likely need to be closed for varying periods of time (e.g., weeks to months at a time), which would create temporary disruptions to local access. In addition, the reduction from four to three travel lanes in order to meet current design standards would likely impact the level of service on other roadways in the local area.

Duwamish River Navigation

Overview

PB evaluated the alternative based on the long-term navigability of the Duwamish River Waterway. The Duwamish River is considered navigable from Elliott Bay to several miles upstream of the South Park Bridge. The bridge is located near the upstream limit of heavy industrial use of the waterway, but it is within the navigation channel maintained by the U.S. Army Corps of Engineers.

The South Park Bridge has a maximum vertical clearance above the water is 32 feet at MHHW. The width of the navigation channel at the bridge is approximately 125 feet. The existing bridge, however, is a bascule bridge and opens to allow marine vessels greater than 32 feet in height to pass upstream or downstream of the bridge. Based on previous documentation, the U.S. Coast Guard preliminary findings found that a minimum vertical 100-foot clearance satisfies navigation clearance requirements. The bridge currently opens an average of three to five times per day to accommodate both industrial and recreational vessels.

The river is currently used for industrial, commercial, and recreational purposes. Several significant commercial marinas, boat repair, and boat manufacturing businesses are also located upstream of the bridge. Recreational boats travel both upstream and downstream of the bridge.

Local water-dependent businesses, as well as the U.S. Coast Guard, have emphasized to King County that any engineering solutions for the South Park Bridge must maintain reasonable navigational access upstream of the existing bridge. Alternatives that would significantly limit access to the navigation of the waterway upstream of the bridge could adversely affect upstream businesses, which could jeopardize the viability of those businesses.

Rating Scheme

The following rating scheme was used to evaluate the preliminary alternatives:

No Impacts: The alternative would not affect the existing navigation channel (lower width approximately 125 feet and unlimited height). All existing types and sizes of vessels that travel upstream would be able to continue to use the waterway. There would be no future decrease to the maximum width or height of vessels passing upstream other than the natural contours of the river bottom and the influences of tides.

Minimal Impacts: The existing bridge would be replaced by a new structure with a minimum 125-foot horizontal clearance and a 100-foot vertical clearance. All existing types and sizes of vessels that travel upstream would be able to continue to use the waterway. The minimal restriction to the waterway would allow upstream access for most vessels using the waterway in the future.

Moderate Impacts: The existing bridge would be replaced by a new structure with a minimum 125-foot horizontal clearance and a minimum 60- to 70-foot vertical clearance. Most of the existing types and sizes of vessels that currently travel upstream would be able to continue to use the waterway. The height restriction to the waterway would allow upstream access for many vessels anticipated to use the waterway in the future, except for some very large commercial and recreational vessels.

Severe Impacts: The existing bridge would be replaced by a new structure with a minimum horizontal clearance of approximately 125 feet or less and a minimum 32-foot vertical clearance. Many of the existing types and sizes of vessels that currently travel upstream would not be able to continue to use the waterway. The height and potential width reductions to the waterway of this alternative would restrict upstream passage of many vessels that currently use the waterway.

Alternatives Analysis

No Action Alternative

The No Action Alternative should be rated *No Impacts*. The existing bridge would be closed and demolished. All piers would be removed from the water. The alternative would not limit either the height or width of vessels traveling upstream, and could actually improve navigability to some extent.

Fixed High-Level Bridge Alternative

The Fixed High-Level Bridge Alternative should be rated *Minimal Impacts*. This alternative would continue to preserve the approximately 125-foot lower width horizontal clearance of the exiting waterway, but would restrict the height of vessels to a maximum of 100 feet.

Fixed Mid-Level Bridge Alternative

The Fixed Mid-Level Bridge Alternative should be rated *Moderate Impacts*. This alternative would continue to preserve the approximately 125-foot lower width horizontal clearance of the existing waterway. This alternative, however, would restrict the height of vessels to approximately 60 feet.

Fixed Low-Level Bridge Alternative
The Fixed Low-Level Bridge Alternative should be rated *Severe Impacts*. This alternative would continue to preserve the approximately 125-foot lower width horizontal clearance of the existing waterway. The alternative, however, would restrict the height of vessels to a maximum of 32 feet.

Movable Span Bascule Bridge Alternative
The Movable Span Bascule Bridge Alternative should be rated *Minimal Impacts*. This bridge type would not restrict the height of most vessels traveling upstream. This alternative would continue to preserve the approximately 125-foot lower width horizontal clearance of the existing waterway.

Movable Vertical Lift Bridge Alternative
The Movable Vertical Lift Bridge Alternative should be rated *Minimal Impacts*. This bridge type would restrict the height of vessels traveling upstream to 100 feet or less, but would continue to preserve the approximately 125-foot lower width horizontal clearance of the existing waterway.

Movable Swing Bridge Alternative
The Movable Swing Bridge Alternative should be rated *Minimal Impacts*. Like the bascule and the vertical lift bridges, this bridge type would not restrict the height of vessels traveling upstream and would continue to preserve the approximately 125-foot lower width horizontal clearance of the existing waterway.

Tunnel Alternative
The Tunnel Alternative should be rated *No Impacts*. The existing bridge would be closed and demolished. All piers would be removed from the water. Future vehicular traffic would cross the Duwamish River via a tunnel constructed below the exiting river bottom. No structures would be placed in the river channel. The alternative would not limit either the height or width of vessels traveling upstream. If the cut-and-cover construction method were used, however, the tunnel would have only a minimal covering of river sediments, which could restrict the common practice of barge operators to drag an anchor or chain to facilitate barge maneuverability.

Retrofit Alternative
The Retrofit Alternative should be rated *Moderate Impacts*. The existing bridge structures would be retained and stabilized. Construction activities would enlarge the existing piers, which would reduce the width of the approximately 125-foot lower width horizontal clearance of the existing waterway by a minimum of 20-30 feet. The continued operation of this bascule type bridge would not limit the height of future vessels traveling upstream.

Community Impacts

Overview

PB evaluated each of the alternatives based on a number of potential impacts to the South Park neighborhood that were identified through the EIS public involvement process, consultation with the City of Seattle, and consideration of relevant plans and policies. Key values of the community are set forth in the City of Seattle Comprehensive Plan, 1994, as amended (January 2001). This document sets forth specific goals and policies for the community to enhance the neighborhood, encourage commercial and industrial development, preserve the existing residential character, and continue to support the neighborhood's role as the service center for surrounding residential areas.

Construction of an alternative could violate one or more of these community planning goals. The required purchase of right-of-way to construct a new replacement bridge or a tunnel could result in the acquisition of local homes and businesses. Based on initial studies, several of the existing commercial buildings fronting on 14th Avenue S. are historic structures. Business displacements would negatively affect the economic vitality of the small South Park commercial district centered along 14th Avenue S.

The existing South Park Bridge is also a major community identity feature of the South Park neighborhood. It is the northern gateway to the community. Residents value the historic character, design, and scale of the existing bascule bridge. In addition, the existing bridge has a relatively low profile in comparison to the single-family residences and small-scale commercial buildings in the South Park neighborhood. There is concern in the community that construction of a new bridge could have a significant adverse impact on the South Park neighborhood. In addition, certain types of bridge designs would result in a change in the visual contrasts between the alternative and the adjacent residential community compared to the existing low profile bascule bridge.

Rating Scheme

The following rating scheme was used to evaluate the preliminary alternatives:

No Impacts: The proposed replacement or rehabilitation of the existing bridge would be consistent with adopted land use plans and policies. No residential or commercial displacements would occur. The residential character of the community and the existing commercial district would not be affected. The historic character of the bascule bridge would be preserved. The alternative would not create any visual impacts.

Least Impacts: The proposed replacement or rehabilitation of the existing bridge would be mostly consistent with adopted land use plans and policies. Fewer than an estimated 15 residential and/or commercial displacements could occur. The residential character of the community is preserved. Visual impacts of the bridge design would be minimal.

Moderate Impacts: The proposed replacement or rehabilitation of the existing bridge would be mostly consistent with adopted land use plans and policies. An estimated 15 to 20 residential and/or commercial displacements could occur. The residential character of the community is preserved, but the economic viability of the commercial district would be adversely affected. Visual impacts of the bridge design could deteriorate the visual quality or neighborhood character.

Most Impacts: The proposed replacement or rehabilitation of the existing bridge would not be fully consistent with adopted land use plans and policies. An estimated 20 or more residential and/or commercial displacements could occur in the community. The residential character of the community is preserved, but the economic viability of the commercial district would be adversely affected. Visual impacts of the bridge design could deteriorate the visual quality or neighborhood character.

Alternatives Analysis

No Action Alternative

The No Action Alternative should be rated *Most Impacts*. The proposed closure of the existing bridge would not be consistent with adopted land use plans and policies. No residential or commercial displacements would occur. The residential character of the existing community would be preserved. The closure of the bridge, however, would significantly reduce traffic traveling through the neighborhood, which could result in significant adverse impacts on the economic viability of the commercial district. In addition, the removal of the bridge would eliminate the community's northern gateway and remove an important historic icon in the South Park neighborhood.

Fixed High-Level Bridge Alternative

The Fixed High-Level Bridge Alternative should be rated *Most Impacts*. The construction of this new bridge would result in extensive impacts to the community. The alternative would not be fully consistent with the adopted land use plans and policies. An estimated two residential structures and potentially 23 commercial/industrial properties could be impacted by proposed right-of-way requirements of the conceptual roadway design cross-section. Many of these buildings are historic. The residential character of the community would be preserved, but the economic vitality of the commercial district would be adversely affected. An important historic icon in the South Park neighborhood would be removed. In addition, the historic character of a low profile bascule bridge would contrast sharply with a high profile fixed-span bridge design. These visual impacts would deteriorate the visual quality of the existing community character.

Fixed Mid-Level Bridge Alternative

The Fixed Mid-Level Bridge Alternative should be rated *Moderate Impacts*. The construction of this new bridge would result in fewer impacts to the community in comparison to a high-level bridge design due to the shorter length of the impact area. The alternative would not be fully consistent with the adopted land use plans and policies. An estimated two residential structures and potentially 17 commercial/industrial properties could be impacted by proposed right-of-way requirements of the conceptual roadway design cross-section. Many of these buildings are historic. The residential character of the community would be preserved, but the economic vitality of the commercial district could be in jeopardy. The historic South Park Bridge would be removed, but the northern gateway to the community would remain. The medium-high profile of this alternative would create less of a visual contrast to the existing low-profile bridge than a high-profile alternative.

Fixed Low-Level Bridge Alternative

The Fixed Low-Level Bridge Alternative should be rated *Least Impacts*. The construction of this new bridge would be mostly consistent with adopted land use plans and policies. An estimated two residential and 10 commercial/industrial properties could be impacted by proposed right-of-way requirements of the conceptual roadway design cross-section. Many of these buildings are historic. The residential character and economic vitality of the community would most likely be preserved. The historic South Park Bridge would be removed, but the northern gateway to the community would remain. The profile of this alternative would be similar to the existing low-profile bridge. The aesthetic character of the new bridge could incorporate historic designs for railings, lighting and other features to preserve an historic character to the bridge. The visual impacts of the new bridge would likely be minimal compared to the existing bridge structure.

Movable Span Bascule Bridge Alternative

The Movable Span Bascule Bridge Alternative should be rated *Least Impacts*. The construction of this new bridge would be mostly consistent with adopted land use plans and policies. The same number of residential and/or commercial/industrial properties as described above for the Fixed Low-Level Bridge Alternative could be impacted based on the conceptual right-of-way requirements. The residential character and economic vitality of the community would most likely be preserved. The historic South Park Bridge would be removed, but the northern gateway to the community would be preserved. Of all of the potential alternatives, this alternative would be most similar to the profile and design of the exiting South Park Bridge. Visual impacts of the new bridge would be minimal.

Movable Vertical Lift Bridge Alternative

The Movable Vertical Lift Bridge Alternative should be rated *Least Impacts*. The construction of this alternative would be generally consistent with adopted land use plans and policies. The same number of residential and/or commercial/industrial properties as described above for the Fixed Low-level Bridge Alternative could be impacted based on the conceptual right-of-way requirements. The residential character and economic vitality of the community would most likely be preserved. Like the other low-profile alternatives, the historic South Park Bridge would be removed, but the northern gateway to the community would be preserved.

The visual impacts of this alternative, however, would be greater than a fixed-span or bascule low-profile bridge. The operation of the vertical lift design requires the construction of two tower-like structures on either side of the movable span. These structures would be approximately 150 feet in height, and significantly taller than adjacent land uses. In addition, the movable span segment of the bridge would be periodically raised approximately 100 feet above the water level. This would be significantly higher than the maximum height of a bascule bridge, which would have a single tower structure for the bridge operator of approximately 65 feet in height. Moreover, the maximum elevation of the bascule bridge structures when open would be considerably less than 100 feet above the water level due to the fact that the movable spans (one half the width of the waterway channel) would not be raised a full 90 degrees.

Movable Swing Bridge Alternative

The Movable Swing Bridge Alternative should be rated *Moderate Impacts*. The construction of this alternative would be mostly consistent with adopted land use plans and policies. An estimated two residential and 11 commercial/industrial properties could be impacted by proposed new right-of-way based on the conceptual roadway design cross section. Many of these buildings are historic. In addition, the alignment of this alternative is further downstream than all of the other alternatives, which would result in greater land use impacts to the residences immediately south of the bridge abutment on the south side of the river. In addition, this alignment appears to require relocation of an equipment/utility building on the Boeing property north of the river. These impacts are slightly greater than the other low-profile design alternatives. The residential character and economic vitality of the community would most likely be preserved. Like the other low-profile alternatives, the historic South Park Bridge would be removed, but the northern gateway to the community would be preserved. The visual impacts of this alternative, however, would be greater than a fixed-span or bascule low-profile bridge. This alternative would have a single operators tower similar to the one described above for the low-level bascule bridge. The operation of the swing type movable bridge, however, requires that the midsections of the bridge rotate 90 degrees to open the waterway channel. Therefore the visual impacts from the width of the bridge structure would periodically change and increase from approximately 66 feet to approximately 150

feet. This change width and resulting visual impacts may be seen as less desirable to residents compared to the periodic increased height of a bascule bridge.

Tunnel Alternative
The Tunnel Alternative should be rated *Most Impacts*. The construction of this alternative would result in extensive impacts to the community. The alternative would not be fully consistent with the adopted land use plans and policies. Like the Fixed High-Level Bridge Alternative, an estimated two residential structures and potentially 23 commercial/industrial properties could be impacted by proposed right-of-way requirements of the conceptual roadway design cross-section. Many of these buildings are historic. The residential character of the community would be preserved, but the economic vitality of the commercial district would be adversely affected. The existing historic bridge, an important icon in the South Park neighborhood, would be removed. In addition, the construction of potentially three overpasses to span the tunnel on the south side of the river would contrast sharply with the existing low-profile character of the adjacent residential neighborhood. These visual impacts would deteriorate the visual quality of the existing community character.

Retrofit Alternative
The Retrofit Alternative should be rated *No Impacts*. Rehabilitation of the existing bridge would be most consistent with adopted land use plans and policies compared to all of the other alternatives. No residential or commercial displacements would occur. Existing historic structures along 14th Avenue S. would remain. The residential character and economic vitality of the existing community would be preserved. The alternative would maintain the community's northern gateway and only minor changes would be visible to the historic character of this icon of community identity.

Aquatic Habitat Protection

Overview

PB evaluated the alternatives based on the anticipated operation phase impact on the aquatic habitat and potential protection and/or enhancement. This evaluation considered alternative alignment, physical impacts to the river, and shading.

The potential impacts of the alternatives would be directly related to habitat characteristics at the Duwamish River crossing. These characteristics are relatively uniform within the existing and adjacent alignment options. Thus, bridge alignment is not likely to produce a discriminating factor for the South Park Bridge alternatives.

Factors that differ among the alternatives are primarily the amount of shoreline, bottom and water column space occupied by the support structures. Each proposed alternative includes some support structures placed within the river channel, but outside the navigation channel. The build alternatives incorporate substantial differences in the sizes of these support structures.

In addition, there is some potential difference among the alternatives regarding shading impacts. A higher-level bridge is likely to have slightly less shading impact than a lower level bridge of the same size and type. However, at this location and for the habitat present, shading impacts would likely to be minor. Additional shading could be produced by the fender system used to protect the bridge piers, but these would be similar for each alternative.

Rating Scheme

The following rating scheme was used to compare the alternatives:

Substantial Improvement: The amount of shoreline, river bottom, and water column space occupied by the alternative would be significantly less than that associated with the existing bridge. The alternative would not cause shading of the aquatic habitat. Aquatic and fisheries habitat would be substantially restored and enhanced.

Moderate Improvement: The amount of shoreline, river bottom, and water column space occupied by new bridge support structures would be less than that associated with the existing bridge. The alternative would result in about the same or less shading of the aquatic habitat compared to the existing bridge.

No Noticeable Improvement: The amount of shoreline, river bottom, and water column space occupied by new bridge support structures would be about the same or slightly more than the existing bridge. The alternative would result in about the same or slightly more shading compared to the existing bridge.

Moderate Increased Impact: The amount of shoreline, river bottom, and water column space occupied by new bridge support structures would be more than the existing bridge. The alternative would result in greater shading of aquatic habitat in comparison to the existing bridge.

Alternatives Analysis

No Action Alternative
This alternative should be rated *Substantial Improvement*. The alternative would remove all existing in-water and shoreline impacts to fish habitat. There would be no shading of existing habitat. Moreover, permitting to remove the structure would require restoration and/or enhancement of the river.

Fixed High-Level Bridge Alternative
This alternative should be rated *Moderate Improvement*. The 2% design drawings show that six round piers (about 6 feet in diameter) would be placed within the river channel. The space occupied by these piers would be less than the existing support structure for the water column and river bottom. This alternative would have slightly less shading impacts than lower profile alternatives. Moreover, permitting would require restoration and/or enhancement of the river.

Fixed Mid-Level Bridge Alternative
This alternative should be rated *Moderate Improvement*. The 2% design drawings show that six round piers (about 6 feet in diameter) would be placed within the river channel. The space occupied by these piers would be less than the existing support structure for the water column and river bottom. This alternative would have slightly greater shading impact than a high-level bridge and slightly less than a low-level bridge. Moreover, permitting would require restoration and/or enhancement of the river.

Fixed Low-Level Bridge Alternative
This alternative should be rated *Moderate Improvement*. The 2% design drawings show that six round piers (about 6 feet in diameter) would be placed within the river channel. The space occupied by these piers would be less than the existing support structure for the water column and river bottom. This alternative would have about the same shading impacts as the existing bridge. Moreover, permitting would require restoration and/or enhancement of the river.

Movable Span Bascule Bridge Alternative
This alternative should be rated *No Noticeable Improvement*. The Movable Span Bascule Bridge Alternative would require two large support structures (about 45 ft. x 100 ft.) within the river channel. The space occupied by these structures would be the same or slightly more than the existing support structure for the water column and river bottom. This alternative would have about the same shading impacts as the existing bridge. Permitting would require restoration and/or enhancement of the river.

Movable Vertical Lift Bridge Alternative
This alternative should be rated *No Noticeable Improvement*. The Movable Vertical Lift Bridge Alternative would require two large support structures (about 30 ft. x 100 ft.) within the river channel. The space occupied by these structures would be about the same as the existing support structure for the water column and river bottom. This alternative would have about the same shading impacts as the existing bridge. Permitting would require restoration and/or enhancement of the river.

Movable Swing Bridge Alternative
This alternative should be rated *No Noticeable Improvement*. The Movable Swing Bridge Alternative would require two large support structures (about 60 feet in diameter) within the river channel, plus shoreline construction of several piers. The space occupied by these structures would be about the same as or slightly less than the existing support structure for the water column and river bottom. This alternative would have about the same shading impacts compared to the existing bridge. Permitting to remove the structure would require restoration and/or enhancement of the river.

Tunnel Alternative
This alternative should be rated *Substantial Improvement*. This alternative would remove all in-water and shoreline impacts to fish habitat in the project area, assuming the existing bridge would be removed with completion of the tunnel. There would be no shading of existing aquatic habitat. Moreover, permitting would require restoration and/or enhancement of the river.

Retrofit Alternative
This alternative should be rated *Moderate Increased Impact*. This alternative would retain all existing in-water and shoreline impacts to fish habitat and fishing. The existing piers would be enlarged to stabilize the bridge structure. The space occupied by these structures would be greater than the existing support structure for the water column and river bottom.

Construction Impacts

Overview

PB evaluated the alternatives based on anticipated construction impacts. The chief factor defining construction impacts is construction duration. Many factors influence construction durations including bridge design, construction methods, number and size of structures in the water, and in-water construction constraints such as commercial boat traffic, tides, and fish windows. The period of construction for any one of the potential alternatives would be a minimum of two years. The fixed-span bridge alternatives would require comparatively short durations for construction activities. Movable bridge alternatives would require longer lead-time for the ordering and fabrication of movable parts, and the in-water construction would require more time for the construction of the massive piers. Construction of a tunnel would require an even longer duration due to the significant amount of in-water construction activities for cut-and-cover methods and restrictions posed by boat and barge traffic on the river and the fish windows.

In addition, PB examined factors that would define the severity of the construction impacts. These issues include noise and air pollution, relocations of utilities, street closures and detours, traffic congestion, impacts to railroad tracts. All road construction projects result in short-term increases in noise and air pollution. The longer the length of the project (south to north terminus), the more likely cross streets would be affected and traffic would need to take detours to avoid the construction area. Extensive excavation activities are also likely to increase the number and duration construction vehicles traveling roads in the project area. The higher the number of roads affected, the more likely traffic congestion in the project area would increase. The preliminary project alternatives that are the longest also would require road reconstruction where the existing railroad tracks cross the north end of 16th Avenue S. near East Marginal Way S.

Rating Scheme

The following rating scheme was used to compare the alternatives:

Low: The construction period is approximately two years or less in duration and construction impacts are least severe.

Moderate: The construction period is approximately 2 years in duration or slightly longer. The construction impacts are modest in severity.

High: The construction period is approximately 2-3 years in duration. The intensity of the construction impacts is most severe.

Alternatives Analysis

No Action Alternative

The No Action Alternative should be rated *Low*. The construction period is estimated to be less than two years in duration. The demolition of the existing structure could be planned to minimize impacts to marine traffic and fisheries. Though the existing bridge would be demolished, the construction impacts would not likely require any street closures or traffic detours. Since no new structure would be constructed, the construction related traffic would be considerably less than alternatives that would require the removal of the existing bridge structure materials and the transport of materials to the project area for the construction of a new structure.

Fixed High-Level Bridge Alternative
The Fixed High-Level Bridge Alternative should be rated *High*. The construction period is estimated to be approximately 2 years in duration. The extreme length of the road project, however, would result in severe impacts to the community. Many cross streets would experience temporary closure and/or traffic would be detoured short distances. The project would require the removal of the exiting bridge structure materials and the transport of considerable materials to the project site due to the bulk of the new structure. The construction activities would require road improvements where the existing railroad tracks cross 16th Avenue S. near East Marginal Way S.

Fixed Mid-Level Bridge Alternative
The Mid-Level Bridge Alternative should be rated *Moderate*. The construction period is estimated to be approximately 2 years in duration. The medium length of the road project in comparison to the other alternatives would result in moderate impacts to the community. Fewer cross streets would be affected than the Fixed High-Level Bridge Alternative. Some roads would be temporarily closed and some traffic could potentially be detoured short distances from the construction area. The construction activities would not affect the railroad tracks near East Marginal Way S.

Fixed Low-Level Bridge Alternative
The Fixed Low-Level Bridge Alternative should be rated *Low*. The construction period is estimated to be approximately 2 years in duration. This alternative is among the shortest of all of the potential preliminary project alternatives. A few roads would be temporarily closed and some traffic could potentially be detoured short distances from the construction area. The construction activities would not affect the railroad tracks near East Marginal Way S.

Movable Span Bascule Bridge Alternative
The Movable Span Bascule Bridge Alternative should be rated *Low*. The construction period would be approximately 2 years in duration. The length of this road project is similar to the Fixed Low-Level Bridge Alternative. The severity of the construction impacts would also be similar to the Fixed Low-Level Bridge Alternative.

Movable Vertical Lift Bridge Alternative
The Movable Vertical Life Bridge Alternative should be rated *Low*. The length of this road project is similar to the Fixed Low-Level Bridge Alternative. The period of construction and the severity of the construction impacts would be similar to those described for the Fixed Low-Level Bridge and the Movable Span Bascule Bridge Alternative.

Movable Swing Bridge Alternative
The Movable Swing Bridge Alternative should be rated *Low*. The length of this road project is similar to the Fixed Low-Level Bridge Alternative. The period of construction and the severity of the construct impacts would be similar to those described for the Fixed Low-Level, Movable Span Bascule, and Vertical Lift bridge alternatives.

Tunnel Alternative
The Tunnel Alternative should be rated *High*. The length of this road project is similar to the Fixed High-Level Bridge Alternative. Many cross streets would be affected by the construction activities and a number of short detours would be established for local traffic. Moreover, the period to construct the Tunnel Alternative would be approximately three or more years in duration.

Retrofit Alternative
The Retrofit Alternative should be rated *High*. The period of construction would be approximately two or fewer years in duration. The construction area is the smallest of all of the alternatives. Local streets in the South Park neighborhood would not be closed. During the entire construction period, however the existing bridge would likely be closed. This is different from all of the other potential alternatives. All traffic that normally would cross the Duwamish River on the South Park Bridge would be rerouted. Traffic during construction would need to cross the Duwamish River using either the 1st Avenue S. Bridge to the north or the Boeing Access Bridge to the south. In either case, traffic detours would be significant distances.

Project Costs

Overview

PB evaluated the alternatives based on the anticipated magnitude of construction as well as operation and maintenance (O & M) costs. No conceptual construction cost estimates have been prepared for any of the alternatives to date, so specific cost figures could not be used in this analysis. Moreover, cost estimates for property acquisition or mitigation requirements have not been evaluated. The underlying basis for the comparison of the alternatives is the comparative costs for demolition and the construction of structures. The assumption is that costs to construct a fixed-span would be approximately half the cost of a movable-span due to the high costs of equipment to operate a movable span. The cost of a tunnel would likely be more than double the cost for a movable-span bridge because of the extremely high costs for ground excavation, irrespective of whether a tunnel-boring machine or a cut-and-cover method were to be used.

PB also evaluated the conceptual magnitude of O & M costs for the alternatives. No specific estimates have been prepared at this time, so specific cost numbers could not be compared. The focus of this analysis considered anticipated costs for road maintenance, bridge structure maintenance, labor to operate equipment of movable-span bridge alternatives, routine maintenance costs for the equipment used in the movable-span bridge alternatives, and potential costs for on-going repair and rehabilitation costs.

Rating Scheme

The following rating scheme was used to compare the alternatives:

Low: Assumes the lowest magnitude construction cost and little to no O & M costs.

Moderate: Assumes the lowest magnitude construction cost and moderate O & M costs.

High: Assumes a moderate magnitude construction cost and high O & M costs.

Very High: Assumes the highest magnitude construction cost and moderate O & M costs.

Alternatives Analysis

No Action Alternative
The No Action Alternative should be rated *Low*. It would be the least costly of the alternatives as the bridge would be closed and demolished. Minor expenditures would address closure of the bridge approaches and fencing to make sure the structure does not become a safety concern. O & M costs would be insignificant considering the structure would not be maintained for functional use.

Fixed High-Level Bridge Alternative
The Fixed High-Level Bridge Alternative should be rated *Moderate*. Fixed bridges in general are less expensive to construct than movable bridges. The significant height of this bridge would make it the most expensive of the three fixed-level bridge alternatives. Due to the height of this bridge, the construction costs could possibly approach the cost of a movable bridge. This bridge would have only modest O & M costs to cover repaving and minor repairs.

Fixed Mid-Level Bridge Alternative
The Fixed Mid-Level Bridge Alternative should be rated *Moderate*. Fixed bridges in general are less expensive to construction than movable bridges. The construction cost of the mid-level bridge would be less than the high-level bridge and more than the low-level bridge. This bridge would have only modest O & M costs to cover repaving and minor repairs.

Fixed Low-Level Bridge Alternative
The Fixed Low-Level Bridge Alternative should be rated *Moderate*. Fixed bridges in general are less expensive to construct than movable bridges. This alternative would be the least costly to construct due to its low profile in comparison to the other fixed-bridge alternatives. This bridge would have only modes O & M costs to cover repaving and minor repairs.

Movable Span Bascule Bridge Alternative
The Movable Span Bascule Bridge Alternative should be rated as *High*. Movable bridges in general are almost double the construction cost of a fixed-span bridge. The construction costs of a bascule bridge would be nearly the same as the other types of similar sized movable bridge designs. The O & M costs for this alternative would include the labor for bridge operators, annual maintenance of the equipment, repaving, and other minor repairs.

Movable Vertical Lift Bridge Alternative
The Movable Vertical Lift Bridge Alternative should be rated as *High*. The construction costs of a vertical lift bridge would be nearly the same as a similar-sized bascule bridge. The O & M costs for this alternative also would be similar to a bascule bridge.

Movable Swing Bridge Alternative
The Movable Swing Bridge Alternative should be rated as *High*. The construction costs of a movable swing bridge would be similar in magnitude to the cost of a similar sized bascule bridge. The O & M costs for this alternative also would be similar to a bascule bridge.

Tunnel Alternative
The Tunnel Alternative should be rated as *Very High*. The construction cost to build a tunnel would be extremely high in comparison to either a fixed-span or movable bridge design due to excavation costs. Moreover, the O & M costs would be quite high considering the need to conduct annual

maintenance work on the jet fans used to evacuate polluted air from the tunnel. In addition, the tunnel walls would need periodic washing and the road surface would need repaving.

Retrofit Alternative
The Retrofit Alternative should be rated *High*. The stabilization and reconstruction of the existing bridge would be quite costly in comparison to the No Action Alternative, and could approach the cost of constructing a new fixed low-level bridge. In addition, due to the poor condition of the bridge, O & M costs would be very high. Over the long-term, the poor condition of the existing bridge would be expected to require major repair and maintenance work. As such, major reconstruction activities would need to be performed to maintain the bridge for a period of time comparable to the expected life of a new bridge.

Comparison of Alternatives

Figure 13 is a summary of the rating of each of the potential alternatives for each of the seven criteria. The text below provides a highlight of the overall rating for each of the alternatives.

No Action Alternative

With closure of the existing bridge and future removal of the existing structure, this alternative would have no impacts to Duwamish River navigation. The alternative would have low construction impacts and the magnitude of the construction costs would be low in comparison to the other alternatives. This alternative could potentially result in substantial improvements to the aquatic habitat. This alternative, however, would cause significant disruptions to both regional mobility and local access. Compared to all of the alternatives, this alternative could result in the most impacts to the community.

Fixed High-Level Bridge Alternative

The high profile of this bridge alternative would result in minimal impacts to Duwamish River navigation. In comparison to the other alternatives, this alternative was rated moderate for regional mobility, aquatic habitat protection, and project costs. This alternative would cause significant changes to local access, high construction impacts, and would result in significant adverse impacts to the community.

Fixed Mid-Level Bridge Alternative

The mid-level profile of this fixed-span bridge alternative would be rated moderate in comparison to the other alternative for most of the evaluation criteria. Construction of this alternative would not impact regional mobility.

Fixed Low-Level Bridge Alternative

The Fixed Low-Level Alternative would result in more adverse impacts than the Fixed Mid-Level Bridge Alternative. This alternative would result in no impacts on regional mobility, minimal changes to local access, and low construction impacts. This alternative is also assessed to have the least impacts to the community and would result in moderate improvements to the aquatic habitat. In contrast, this alternative would also cause among the most severe impacts to navigation of the Duwamish River in comparison to other alternatives.

Movable Span Bascule Bridge Alternative

Overall, the Movable Span Bascule Bridge Alternative would have lower impacts compared to the other alternatives. This alternative would have no impacts to regional mobility, minimal changes to local access, minimal impacts to navigation in the Duwamish River, among the least impacts to the community, and low construction impacts. This alternative, however, was rated no noticeable improvement to the aquatic habitat. More importantly, the anticipated magnitude of project costs for this alternative would be expected to be high compared to the other alternatives.

Movable Vertical Lift Bridge Alternative

Though a different design of movable bridge, the Movable Vertical Lift Bridge Alternative rated the same for each of the criteria as the Movable Span Bascule Bridge Alternative. Slight differences do exist, though. This opening and closing time to operate this bridge alternative would be approximately 10-15 minutes, compared to the 4-6 minutes of the bascule design alternative. In addition, the visual impact of this alternative is quite different from the Fixed Span Bascule Bridge Alternative. Both the support towers and the raised section of the bridge deck when the bridge is open would be significantly higher in elevation than the bascule type bridge.

Movable Swing Bridge Alternative

The Movable Swing Bridge Alternative rated the same as both the Fixed Span Bascule Bridge Alternative and the Movable Vertical Lift Bridge Alternative. This bridge design, however, does differ in several ways from the bascule type bridge. Like the Movable Vertical Lift Bridge, the opening and closing time to operate this bridge would be approximately 10-15 minutes, compared to the 4-6 minutes of the Fixed Span Bascule Bridge Alternative. In addition, when the bridge is open, passersby and residents the profile of the width of the bridge would increase as opposed to the changes in vertical profiles of the other two movable bridge alternatives.

Tunnel Alternative

The Tunnel Alternative was rated poorly for many of the evaluation criteria in comparison to the other alternatives. This alternative would have minimal impacts to navigation in the Duwamish River and would result in moderate impacts to regional mobility. In contrast, this construction of this alternative would result in significant changes to local access, among the most impacts to the community, high construction impacts, and very high project costs. A clear advantage of this alternative would be a likely substantial improvement to aquatic habitat following construction activities.

Retrofit Alternative

The evaluation ratings for the Retrofit Alternative is mixed compared to the other nine alternatives. Compared to all other alternatives, this alternative would have no long-term impacts to the existing community. It would result in only minimal impacts to regional mobility and local access. The alternative would likely have moderate impacts to navigation in the Duwamish River. In contrast, this alternative would potentially have a moderate increased impact to the aquatic habitat. Construction impacts would be high and project costs would also be expected to be high in comparison to the other nine alternatives.

6. CONCLUSIONS AND RECOMMENDATION

This chapter presents the conclusions of the evaluation study and the PB recommendation for which of the potential nine alternatives should be considered for detailed analysis in the EIS for the South Park Bridge Project.

Conclusions

Based on the previous chapters defining each alternative, the 2% engineering and environmental evaluation applied to each alternative, and input from the PAC and the CAG, the Project Team has the following conclusions for each of the nine preliminary alternatives.

No Action Alternative

The No Action Alternative was evaluated as part of the conceptual 2% design alternative evaluation and should be further studied in the environmental impact statement based on NEPA/SEPA requirements.

The No Action Alternative assumes that if the existing bridge is not replaced or rehabilitated, the bridge would need to be closed in a near future year due to deteriorating conditions of the existing structure. In essence the "link" between the north and south side of the Duwamish River would be removed. No vehicular, pedestrian, or bicycle traffic would be able to cross the river.

The removal of this "link" would have:

- severe impacts to the South Park community in terms of local access;
- severe impacts to the regional transportation corridors
- least costs to construct, maintain and operate the existing or new bridge
- least impacts during construction
- no restrictions to river traffic.

Fixed High-Level Bridge Alternative

The Fixed High-Level Bridge Alternative was selected for the preliminary alternatives evaluation because the FHWA requires that the EIS study a fixed-span bridge design as part of the alternatives evaluation. Also, it is necessary to evaluate an alternative that accommodates all anticipated Duwamish River traffic that requires clearances of 100 feet (per U.S. Coast Guard Letter, dated June 10, 2002).

The Fixed High-Level Bridge Alternative:

- would have the most impact to the South Park community (e.g. visual, displacements, and local access)
- would have the highest impact during construction
- would have moderate impacts to regional mobility
- satisfies the U.S. Coast Guard waterway user requirements.

Fixed Mid-Level Bridge Alternative

A Fixed Mid- Level Bridge Alternative was selected for alternatives evaluation based on input from the two public workshops, the PAC, and the CAG. It was the preferred alterative based on the previous 1994 Design Report. As with the Fixed High-Level Alternative, the FHWA requires that the EIS study a fixed-span bridge design as part of the alternatives evaluation.

The Fixed Mid-Level Bridge Alternative:

- would have moderate impacts to the South Park community (visual, displacements, and local access)
- would have no impacts to regional mobility
- would accommodate most of the Duwamish River traffic
- would likely affect boat manufacturing, repair, and maintenance businesses located upstream of the existing South Park Bridge.

Fixed Low-Level Bridge Alternative

A Fixed Low-Level Bridge Alternative was selected for alternatives evaluation based on input from the Project Team, the PAC, and the CAG. As with the Fixed High-Level Alternative, the FHWA requires that the EIS study a fix bridge design as part of the alternatives evaluation.

The Fixed Low-Level Bridge Alternative:

- would have severe impacts to Duwamish Waterway traffic
- would have the least displacement impact to the South Park community
- would have the least construction impact
- would have no impacts to regional mobility and minimal changes to local access within the South Park community.

Movable Span Bascule Bridge Alternative

A Movable Span Bascule Bridge Alternative was selected for alternatives evaluation based on input from two public workshops, the PAC, the CAG, and previous reports. This alternative most closely replicates the exiting bridge structure type.

The Movable Span Bascule Bridge Alternative:

- would have high construction costs (and operating and maintenance costs)
- would have no impacts to regional mobility and minimal changes to local access within the South Park community
- would have the least impacts to Duwamish River traffic
- would have the least displacement impact to South Park community
- would have the least construction impact.

Movable Vertical Lift Bridge Alternative

A Movable Vertical Lift Bridge Alternative was selected for alternatives evaluation based on input from the Project Team, the PAC, and the CAG.

The Movable Vertical Lift Bridge Alternative:

- would have high construction costs (and operating and maintenance costs)
- would have no impacts to regional mobility and minimal changes to local access within the South Park community, but would add more delay than the bascule operations in regards to opening/closing times
- would have the least impacts to Duwamish River traffic but is not unlimited.
- would have the least displacement impact to the South Park community
- would have the least construction impact.

Movable Swing Bridge Alternative

A Movable Swing Bridge Alternative was selected for alternatives evaluation based on input from the Project Team and considering the input from the PAC and the CAG.

The Movable Swing Bridge Alternative:

- would have high construction costs (and operating and maintenance costs)
- would have no impacts to regional mobility and minimal changes to local access within the South Park community, but would add more delay than the bascule operations in regards to opening/closing times
- would have the least impacts to Duwamish River traffic.
- would have the least displacement impact to the South Park community, though would potentially require relocation of an equipment/utility building on the Boeing property north of the river
- would have the least construction impact.

Tunnel Alternative

A Tunnel Alternative was selected for alternatives evaluation based on input from two public workshops, the Project Team, the PAC, and the CAG. This was not a previously studied alternative. This alternative was specifically requested by a member of the CAG at a community workshop. The Project Team and PAC concurred that this should be an alternative to evaluate as part of the conceptual 2% design alternative evaluation process.

For purposes of avoiding impacts within the Boeing Field right of way and keeping the tunnel length within the practical project area, the environmental impacts of this alternative assume the cut-and-cover construction methodology would be used. In essence, the necessary roadway improvements would be very similar to the Fixed High-Level Bridge Alternative.

The Tunnel Alternative:

- would have the very highest construction costs
- would have the most impact to the South Park community (displacements and local access, though minor visual impacts)
- would have the highest impact during construction
- would have moderate impacts to regional mobility
- would have no long-term impact to the Duwamish River traffic.

Retrofit Alternative

A Retrofit/Rehabilitation Alternative was selected for alternatives evaluation based on input from two public workshops, the PAC, the CAG, and the Project Team. This alternative was also previously studied.

The Retrofit Alternative:

- would have high impacts during construction
- would have high construction costs
- would have no impact to the South Park community
- would have minimal impacts to regional mobility and local access

Recommendations

Based on the above analysis, the PB Team recommends the following alternatives should be further studied as part of the Environmental Impact Statement.

No Action Alternative

This alternative is required per NEPA/SEPA guidelines.

Retrofit Alternative

This alternative is a preferred alternative of the CAG, particularly over any fixed-span alternatives. This is the only alternative that would rehabilitate the existing bridge, thereby allowing for maximum preservation of historic values and minimal change to the South Park neighborhood.

New Movable Bascule Alternative

This alternative had the least potential impacts in comparison to the other new movable alternatives considered. The CAG prefers this alternative to any of the fixed-span alternatives. This alternative does not provide historic preservation of the existing bridge, but it minimizes disruption to the South Park community during construction with the less extensive long-term impacts overall.

Fixed High-Level Bridge Alternative

This is the only alternative that both satisfies the requirement by the FHWA that a fixed-span alternative be studied and permits the continuation of current waterway use without additional compensatory measures.

Fixed Mid-Level Bridge Alternative

This alternative also satisfies the requirement by the FHWA to study a fixed-span alternative with less impact on the South Park community while continuing to permit upstream access for most of the current waterway users. However, it would limit access for upstream business activities that do sometimes require greater vertical clearance than 60 feet. The potential impacts of a mid-level fixed-span bridge to waterway users will require more detailed analysis in the Draft EIS.

In accordance with NEPA and SEPA, this recommended set of alternatives provides a sound basis for evaluating the full range of potential impacts associated with finding an effective and feasible long-term solution for the South Park Bridge. They address the wide range of concerns expressed during the data-gathering and scoping phase of this EIS process. Consequently, they provide a solid foundation for a defensible EIS regardless of which alternative ultimately selected as the preferred alternative or constructed by King County.

FIGURES

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